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China Report

SCIENCE AND TECHNOLOGY

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CHINA REPORT

SCIENCE AND TECHNOLOGY

CHINA ADDRESSES ENVIRONMENTAL ISSUES

CONTENTS

REGIONAL TRENDS

STATE COUNCIL ENVIRONMENTAL PROTECTION DECISION

Contents of Decision

OW221437 Beijing XINHUA Domestic Service in Chinese 0145 GMT 20 May 84

[Text] Beijing, 20 May (XINHUA)--The State Council on 8 May made a decision on environmental protection work.

The decision says: A basic national policy in China's socialist modernization drive is to protect and improve the living ecology and environment and prevent environmental pollution and damage.

The main contents of the State Council decision are as follows:

--A committee on environmental protection is to be set up under the State Council. Its tasks are to study and approve environmental protection principles and policies, set forth planning requirements, and lead, organize, and coordinate the environmental protection work in the whole country. The State Planning Commission, the State Economic Commission, and the State Science and Technology Commission will be responsible for doing a good job in balancing environmental protection overall while drawing up plans for national economic and social development, promoting production and construction, and developing science and technology. Industry, communications, agriculture, forestry, fishery, oceanography, health, foreign trade, tourism, and other departments concerned, as well as PLA units, will be responsible for doing a good job in preventing and controlling pollution and protecting the ecology of each department. All the aforementioned departments should set up their own corresponding environmental protection organization. The people's governments in all provinces, autonomous regions, and municipalities, as well as in all cities and counties, must assign a comrade to specially take charge of environmental protection work. Provinces, cities, and counties where industry is concentrated, environment is seriously polluted, or the ecology is damaged may set up an environmental protection administrative organ at the bureau level. People's governments in districts, towns, and townships should also assign full-time or part-time cadres to supervise the work. Large- and medium-sized enterprises, institutions, and units concerned should set up environmental protection organizations or assign special personnel to do the work in accordance with actual needs.

--New expansion and renovation projects, technical transformation projects, and all engineering and natural development projects, which might cause

environmental pollution or damage, must strictly implement the measures to prevent and control pollution and ecological damage and comply with the regulation to simultaneously design, construct, and put into production the principal parts of a project. Projects under construction or already put into operation without antipollution measures must, without exception, take remedial measures. People's governments at various levels must strengthen the leadership over industrial enterprises run by towns, townships, and neighborhoods in order to effectively prevent and control environmental pollution and damage. It is necessary to earnestly protect the agricultural ecology and environment. Environmental protection departments at various levels must work together with departments concerned in popularizing ecological agriculture and preventing pollution in and damage to the agricultural environment.

--Environmental protection departments must take decisive action together with economic management departments to resolutely renovate old enterprises with poor economic results and serious pollution and, when necessary, shut down or suspend some of the enterprises.

--It is necessary to adopt the policy of comprehensive utilization. Factories, mines, and enterprises are exempted for 5 years from turning over to the state profits earned from products developed from comprehensive utilization to prevent and control pollution. They can retain the profits to continue comprehensive utilization to control pollution. This regulation will remain valid after the change from profit delivery to taxation has taken place. Factories, mines, and enterprises are exempted from construction taxes when they use self-collected funds and environmental protection subsidies to build antipollution projects or build and move to new facilities because of pollution. Enterprises may apply, in accordance with regulations, for bank loans on favorable terms to fund pollution prevention and control or comprehensive utilization of waste gas, waste water and industrial residue.

The State Council Committee on Environmental Protection has already been set up. Li Peng is the chairman and Song Ping, Li Ximing, Zhao Dongwan, and Zhao Weichen are vice chairmen.

Environmental Capital Investment

OW180255 Beijing Domestic Service in Mandarin 1200 GMT 14 May 84

[Text] In order to strengthen leadership over environmental protection, and the building of environmental organizations, the State Council recently promulgated a decision concerning environmental protection work. The decision requires that the State Planning Commission, the State Economic Commission, and the State Science and Technology Commission, take responsibility for doing a good job in the overall balance of environmental protection, while drawing up plans for national economic and social development, promoting production and construction, and developing science and technology.

The decision also requires that new expansion and renovation projects, technical transformation projects, and all engineering and natural development projects, which might cause pollution in, and damage to, the environment, must strictly follow the procedures for reporting and requesting approval contained

in the report on the effects on the environment, implement the measures to prevent and control pollution and ecological damages, and comply with the regulation to simultaneously design, construct, and put into production the principal parts of a project.

The decision explicitly points out that the investment on capital construction needed by environmental protection departments for building environmental monitoring systems, institutes and schools, model engineering projects for environmental protection, and conducting scientific research projects should be respectively included in the central and local investment plans. The amount of the investment should be increased annually.

Committee on Environment Established

OW190226 Beijing XINHUA in English 1047 GMT 18 May 84

[Text] Beijing, May 18 (XINHUA)--The State Council has set up a special committee headed by Vice Premier Li Peng to supervise and coordinate the country's environmental protection. Operating under the State Council, the committee will examine and approve environmental protection principles and policies. The committee consisting of leading officials of various ministries will be the planning, leadership, organization and coordination body. The office of the committee will be at the Ministry of Urban and Rural Construction and Environmental Protection.

CSO: 4008/313

ENVIRONMENTAL PROTECTION IS BASIC STATE POLICY

HK170658 Beijing RENMIN RIBAO in Chinese 11 Apr 84 p 5

[Article by Qu Geping [2575 2706 1627]: "Why We Say Environmental Protection is a Basic National Policy"--passages within slantlines published in boldface]

[Excerpts] As a basic guarantee and strategic task of the modernization program, environmental protection is a major national policy. How should we understand the notion that environmental protection is a basic national policy?

/Preventing and controlling environmental pollution and maintaining ecological balance are the basic precondition for ensuring agricultural development./

China has a large population but scant per capita resources, biological resources in particular. In China, the amount of cultivated land per person is 1.5 mu, only 27 percent of the world average; amount of grassland per person 4.7 mu, approximately 40 percent of the world average; and amount of afforested area per person 1.8 mu, merely 12 percent of the world average. With the growth in its population, China's amount of cultivated land, grassland, and afforested land per capita will further decrease.

The fact that China has scant per capita biological resources means that we must attach particular importance to the work of environmental protection and put the limited resources to full and rational use so that they can be used continuously and multiply ceaselessly. Only in so doing can we ensure the food supply of the people and promote the stable and sustained development of the national economy.

/Preventing the environment from further worsening and steadily improving environmental quality are the important conditions for promoting sustained economic development./

Being already very serious, environmental pollution in China has not only jeopardized people's work and livelihood and is becoming a pronounced social problem with each passing day but also has eaten away valuable energy and resources, thus causing heavy economic losses.

China's natural conditions have also been seriously disturbed. China's rate of forest cover is only 12.5 percent of its total area, thereby ranking 120th in the world in this respect. The excessive opening up of forests, the reclamation of wasteland by destroying forests, and the wanton felling of trees have brought about constant damage to forest resources, thus resulting in unusual climates, a disturbed ecological balance, and repeated natural calamities in many regions. China has 3.3 billion mu of exploitable grassland. This is an important biological resource. However, the irrational opening up of grassland, the random gathering of grass for fuel, and excessive grazing have caused grasslands to deteriorate and become granulated, brought serious damage to animal and plant resources, and resulted in a drastic decline in the growth of animals and plants. The disruption of vegetation has aggravated soil erosion. China soil erosion totals at least 5 billion tons a year and tens of millions of tons of chemical fertilizers are washed away every year along with the loss of water. Hence, China has become one of the countries in the world which suffer most heavily from soil erosion. In addition, China's water resources and wild animal and plant resources have also been damaged seriously, thus causing tremendous economic losses.

What we have mentioned above indicates that the fact that China's limited biological resources are quite seriously polluted and damaged has presented a major obstacle to the rejuvenation of our economy, the development of agricultural production in particular. Therefore, it is necessary to adopt powerful measures to promptly change this passive situation and clear the path for the smooth development of the national economy.

/Creating a suitable, sound living environment and natural environment is the major objective of the "four modernizations."/

What kind of modernization are we struggling for?

We are struggling for socialist modernization. The fundamental aim of this modernization is to satisfy the material and cultural needs of the masses of people as far as possible and to let the entire people have a happy life rather than grabbing the maximum profits as the capitalist countries do or carrying out production for the sake of production and conducting modernization for the sake of modernization. With this aim in view, we must have our own characteristics in the mode and objective of development.

In the mode of development, we must take a new path and implement the principle of making overall plans and taking all factors into consideration in economic and social development or, in other words, we must develop the economy on the one hand and protect the environment on the other and attain not only better economic and social results but also better environmental results so as to ensure the harmonious development of the economy, society, and environment. Provided we adhere to this mode of development, we can create a clean, beautiful, and sound living and natural environment while realizing our modernization program.

In terms of the objective of modernization, while striving for the attainment of material interests, we must realize the cultural and spiritual objective, that is to say, we must strive for the realization of a high level of both material and spiritual civilization. A clean, beautiful, and sound living environment and natural environment is indispensable to the building of the two civilizations and an important indication of the realization of socialist modernization.

Measured by the abovementioned requirements, we still have a long way to go in this respect. In our economic construction, comparatively speaking, more attention is paid to economic laws than natural laws and to economic results than environmental results. This has thus resulted in serious environmental pollution and ecological disruption. This being the case, planning and economic departments at various levels are required, while making arrangements for construction and production, to genuinely have a clear picture of the aim of environmental protection, correct the development orientation, and take a path of giving priority to environmental protection and production and construction simultaneously in the spirit of "environmental protection is a major national policy."

/We must integrate our long-term and short-term endeavors, and make overall plans by taking all factors into consideration, namely, we must make arrangements for not only people of this generation but also for our future generations./

While giving consideration to the interests of people of this generation, we must think of the interests of our future generations and give them a relatively sound environment so that they will live a happier and better life on the land covering 9.6 million square kilometers. Therefore, while making arrangements for economic and social development, we must take into account both past experience and the situation that may possible arise in the future, make overall plans, correctly handle the relationship between immediate and long-term interests, and resolutely not do things which bring benefits only to people of this generation but gravely harm the interests of our future generations.

In sum, the assertion that regards environmental protection as our national policy is determined by our national condition. It is entirely correct and necessary. If we fail to pay close attention to the work of environmental protection, by the end of this century environmental pollution and ecological disruption in China will become a problem which is extremely hard to solve much like the present question of population. China's environmental and population problems are very similar. We have lacked an adequate understanding of the question of population and failed to take positive countermeasures for many years in the past, thus leading us to the extremely passive position we are in today. This is a grave lesson. If we now also treat the question of the environment casually, the question is very likely to develop to the point of gravity by 1990, not to say by the year 2000. Like the question of population, to recover the polluted environment or the disrupted ecological balance will not only consume huge amounts of funds

but also take a long time, and in some cases, they are irrecoverable. Regarding environmental protection as the strateigc principle and national policy concerning the modernization program is a big step forward in our understanding and a reflection of the maturity of our guiding ideology. We must give wide publicity to this strategic thinking and help the broad masses of people, leading cadres in particular, to willingly pay close attention to the work of environmental protection, to ensure the syncronous development of the work of environmental protection and of economic and social construction, and to build a socialist, clean, and beautiful modern country with Chinese characteristics.

CSO: 4008/298

WAN LI DISCUSSES ROLE OF ECOLOGICAL ECONOMICS

HK160926 Beijing RENMIN RIBAO in Chinese 6 Apr 84 p 5

["Excerpts" of speech by Wan Li delivered at the National Symposium on the Science of Ecological Economy and the meeting marking the establishment of the China Society of Ecological Economics--"A Strategic Problem in Socialist Construction"]

[Text] In the various aspects of production and life, our country and the hundreds of millions of people need a fine ecological environment so as to promote economic development and constantly improve the people's material and cultural life. Therefore, we need experts and scholars to engage in the study of ecological economy [shengtai jingji 3932 1966 4842 3444], to study the relations between economic development on one hand and natural resources and ecological environment on the other by integrating theory with practice, to combine economic results with ecological results, and to enable China's economy to steadily and swiftly develop on a coordinated basis.

An Important Matter Concerning the Cause of Building Socialist Modernization

Generally speaking, China lacks an understanding of the problem of ecological economy. Since the founding of the PRC, it is beyond doubt that we have scored great achievements in socialist construction. However, there are also many mistakes. One of them is that we did not pay due attention to ecological balance and improvement of China's ecological environment and we lacked relevant measures. As a result, the destruction of natural resources and deterioration of the ecological environment have yet to be effectively curbed. Instead of taking a turn for the better, ecological conditions in some localities have become worse.

Forests play an extremely important role in the general system of agricultural ecology. Although there has been a great development in afforestation in China since liberation, the declining trend of forest resources has not been fundamentally changed. The available forests at present, such as the forests in Changbaishan, Daxinganling, Xiaoxinganling, and the southwest region were all left by our ancestors. The forests actually created since liberation constitute only a small portion. So far, the annual consumption of forest resources is greater than its growth and there is a frequent practice of indiscriminately cutting trees. Destruction of forests is bound to deteriorate the ecological environment and affect industrial and agricultural production.

Viewed from the angle of ecological economy, it is necessary to study and solve the problem of forest operation and management. We must strive to ensure the needs of timber for the national economy and the people's livelihood and also ensure that the various ecological results of forests can be given full play. We must put an end to the destruction of forests and reverse the declining trend of forests. We must realize that the problem of greening the environment is not merely an economic problem, but a problem that concerns the survival of mankind.

Land is the basic means of production for agricultural production. China has a large population and a scarcity of arable land. Due to a variety of reasons, arable land is densely occupied, the state of soil erosion is serious, and the fertility of soil is reduced to some extent. In the 1950's the area of soil erosion throughout the country was 1.5 million square km. Although 400,000 square km of land has been brought under control in the past 30-odd years, this cannot catch up with the rate of destruction. Soil erosion in the Huang He Valley has not been controlled and the area of soil erosion in the Chang Jiang Valley is expanding. Owing to irrational reclamation, excessive grazing and cutting of trees, and other reasons, the grasslands are being turned into sand and the state of degeneration is continuously expanding, the production and quality of forage grass are declining, and the capacity for animals is decreased.

China's sea fishery has developed relatively fast. However, we laid particular stress on increasing fishing equipment in the past and neglected the protection of fishery resources. At present our fishing capacity has already exceeded the reproduction capacity of inshore aquatic resources, but the number of fishing boats are still increasing and the catching of small fish and destruction of resources continues. We must adopt resolute measures to restore offshore aquatic resources. We must make investigations and studies, give ecological economic arguments, and propose solutions to the rapid development of sea and freshwater breeding.

The ecological environment around us is a system in which the relations between organic and inorganic substance, between animals and plants, and among animals are related and also condition each other. There are many people who do not understand this truth. They harm the beneficial birds and animals for their immediate economic interests, thus upsetting the ecological balance and causing an increase in insect pests. Consequently, they lose more than they gain.

China is rich in total water resources. However, the average per person is limited and the distribution of the water resources is uneven. This problem should be brought to our attention. At present the amount of water in many cities and rural areas is limited and its quality is poor. Underground water in most cities is polluted. In the days to come, the problem of water resource shortages in northern cities will be more prominent.

Pollution from industrial waste is also extremely serious. According to incomplete statistics, the amount of money paid merely for the compensation of agricultural accidents caused by industrial pollution in the past years totaled 100 million yuan. Although the industrial departments have to pay the money, the arable land is polluted, and both sides suffer.

Pollution of the environment also seriously affects the people's health. Some diseases can be called environmental disease.

It has been discovered in the past few years that there is also acid rain in China. Acid rain is a serious hazard to industrial and agricultural production and to the people's health. These ecological economic problems, which are serious hazards to the people's health and our future generations, must be conscientiously studied and solved in the course of modernization.

There is another problem concerning building cities according to the law of ecological economy. While approving the "general scheme for urban construction of Beijing," the CPC Central Committee and the State Council took into account the state of ecological economy in Beijing City. All other cities also have problems in this respect. They should do the development plans well and build in line with local conditions.

The above problems show that the solution to the ecological economic problem is an important matter that concerns the building of socialist modernization. It shows that the ecological economic problem in China calls for profound study and solution. A century ago, Engels repeatedly referred to the problem of ecological economics in his article "The Role of Labor in the Transformation of Ape to Man." He listed many historical examples in Mesopotamia, Greece, Asia Minor, the Alps, and Cuba to prove that the people will be punished doubly if they counter its law.

China has already strengthened the work in this respect in recent years. In the course of structural reform, we established the Ministry of Urban and Rural Construction and Environmental Protection. In 1979, we established the China Environmental Sciences Society. Now we have established the China Society of Ecological Economics, in which we strengthened leadership from both the administrative bodies and academic organizations. All this shows that China is now awake in this respect. Our cadres should also awaken themselves as early as possible. One of the important reasons why there were so many problems in the past is that our cadres lacked an understanding of this problem. Instead of running things according to the law of economy and nature, they did some foolish things, which destroyed the ecological environment and caused the economy to suffer. From now on, these foolish things should no longer be allowed to occur.

Use the Viewpoint of Ecological Economy To Guide Economic Construction

The problem of ecological economy is closely related to our socialist construction. It determines, in a certain sense, the speed and quality of our construction. The imbalance of ecology and the destruction of the environment are facts that existed long ago. Viewed from international academic development, ecological economics, as an independent branch of learning, is a rather new subject. It was raised only a few years ago in China. Therefore, it is impossible to avoid a lack of understanding in this respect. However, to solve the problem, we must make a deep study, increase our understanding, and correctly handle the matter.

Prior to the 3d Plenary Session of the 11th CPC Central Committee, particularly during the 10 years of turmoil, there was a prevailing erroneous viewpoint, which held that the vicious cycle caused by the destruction of ecology would only take place in capitalist countries and never in our socialist country.

This is a one-sided understanding of the problem of ecological economy. Production in a capitalist society, which has a plundering nature, is bound to destroy the ecological balance and cause serious disasters. In the final analysis, the destruction of the ecological balance is the consequence of running counter to the law of nature. If we do so, we will also be punished by nature even though we are a socialist state. Naturally, as socialist system differs from capitalist system, it can appropriately integrate the interests of the part with the interests of the whole and immediate interests with long-term interests.

At the 12th CPC National Congress, China called for maintaining ecological balance and regarded it as the prerequisite for production and construction. In response to the party's call, all localities throughout the nation are planting trees and grass and taking measures to prevent pollution and to control erosion of soil by wind and sand. Nevertheless, the destruction of ecology is the evil consequence of a long period of time, which cannot be changed within a short period. We must correct the views that hold that the ecological environment in China will not be destroyed and will not cause evil consequences. Any carelessness is liable to cause extreme harm to our socialist production and construction and the people's life.

Confronting ecological destruction and environmental pollution, some people have proposed to abandon the development of industry and to restore the original state of nature. Such a proposal is not acceptable. As was pointed out by Marx long ago: As man is the master of nature, he must not only adapt himself to and be restricted by nature, but should also make unremitting efforts in understanding the law of development of nature, and master and transform nature so that it can serve the production and life of mankind. Fundamentally speaking, the production by mankind is nothing but the conversion of energy and materials. Such conversion will not necessarily destroy the ecology and pollute the environment. The reason for the increasingly grave problem of ecological destruction and environmental pollution in the past did not lie in the conversion of energy and materials, but in that we did not discover and apply a scientific method that could promote economic and social development and also protect the ecological environment. In other words, when human history developed to a certain stage, such a scientific method had not yet been discovered and applied. Now, when human society and scientific research have developed to a new stage, we have put forward the problem of protecting the environment and discovering a series of ways and means for natural science and economic management. The problem to be solved in ecological economy is not only to prevent destruction of the environment, but also to rationally convert energy and materials so that natural resources can be appropriately utilized for a long time to come. The solution of the ecological economic problem and the guidance of economic construction based on ecological economic thought should not become a burden of economic construction work, but must be an important means to scientifically organize production and develop the economy. We should be aware

that the new technological revolution carried out recently in the world has revealed a bright prospect to us in this field. The experience in China has also proved that by using ecological economic thought to guide and organize construction, we can achieve fine economic results, obtain a fine environment, and ensure that mankind will develop in a better manner.

We should regard the maintenance of the balance of the ecological economy as an important principle and use it to guide our economic work. Modernization in China is carried out under certain natural environmental and social economic conditions. Therefore, the results of all economic work are conditioned by both the law of economics and the law of nature. The matter of respecting the ecological economic balance is in fact a matter of respecting objective law. It is because we have not paid due respect to economic law that we have suffered a great deal in our work. In recent years, although we have attached importance to the role of economic law, we have lacked understanding of the role of natural law. For example, while building a factory, it would save a certain amount of investment if we cut back on equipment for eliminating pollution and treating the "three wastes." When the poisonous material is diffused, it may not be noticed by the people at first. Once circumstances become grave we would be forced to adopt measures, which is not only harmful, but also requires more complicated and remedial measures to solve the problem. As the capitalist countries had already undergone such experiences, why should we follow the same old disastrous road? As another example, it is true that by felling forest trees or destroying a piece of grassland, reclaiming land from a lake, and irrationally growing crops we may obtain some grain.

But it will make the soil erode, the rivers silted, and the farmland barren. These losses are immeasurable. The harm caused by either destroying forests and grasslands, reclaiming land from lakes, or the pollution of the "three wastes" in industry may not be serious at first. As a result, no one would ever notice the matter. But as time passes by, the harm will then be turned into a problem difficult to deal with. Therefore, while carrying out socialist construction we must not only carefully figure the economic results of each unit, but also take into account the construction of other projects and the economic results of the whole. While carrying out construction of a certain project, we must not only think of immediate results, but also take into account the prevention of disasters and the interests of our future generations. From now on, in both planning and construction work we must seriously and carefully consider the problem of respecting the ecological economic balance, regard it as a guideline, and implement it in all our economic work.

We should affirm that in the past it was absolutely necessary to maintain overall balance of the economy while working out the national economic plan and obtaining economic and technical argument while building large projects. The problem is, we lacked consideration and simply did not take into account the matter of maintaining ecological balance. As a result, the role of some large projects, into which we put a great amount of human and material resources and investment, was offset by certain faults caused by the destruction of ecological balance. Apart from failing to bring about due economic results, they cause a colossal loss to the state. There are many such experiences and lessons. Those who are engaged in economic work should have ecological economic sense. From now on we must maintain both overall economic balance and ecological economic balance in working out the national economic plan. In planning large projects we must obtain both economic and technical arguments and ecological economic arguments.

We should make ecological economic forecasts of various aspects and try to avoid ecological economic faults before putting plans into effect. We should make conscientious studies and obtain ecological economic arguments for the major economic problems concerning regional planning of agriculture, industrial distribution, urban development, key construction projects, and so on, and place all our economic and construction work on a further stable basis that conforms to ecological economic balance. While carrying out the work in this respect, the departments concerned should earnestly incorporate the suggestions made by scientists.

Strengthen Leadership, Promote Research Work in Ecological Economics

The problem of ecological economy is a strategic problem. Whether or not the work in this respect is done well affects the overall situation of China's modernization program. Therefore, we must attach great importance to this work. The first task of the society of ecological economics is to conscientiously sum up the experience of 30-odd years' construction in China from the angle of ecological economy, find out the mistakes and defects in our economic development, and see what could have been done but have not yet been done. These experiences and lessons are our valuable wealth, which are good for deepening our understanding of the law of economy and nature. Doing well the work of ecological economy is not merely the task of scientific workers, but also the task of various departments of the state and all localities. Only when the whole party, army, and nation go into action together can this work be done well. The most important task at present is that leading cadres at all levels should attach importance, deepen their understanding, and implement measures.

1. Vigorously carry out research on the problem of ecological economy.

As ecological economics is a new branch of learning and China is rather weak in this field, we must actively support and let it develop rapidly.

In carrying out work in this field we must first integrate theory with practice. There are many ecological economic problems in our modernization program that call for study and solution. The masses have rich experiences in appropriately handling the relations between production and the environment. The vast numbers of ecological economic research workers should help the masses in summarizing and improving their experiences. Our ecological economic research workers should plunge themselves into the practice of economic construction and conduct investigations concerning the problem of ecological economy. The departments concerned should enthusiastically supply them with materials and data. Scientific research departments should integrate with practical work departments and together make studies on the major problems of ecological economy, advance feasible scientific proposals, and provide a scientific basis for the state to formulate policies. The research of realistic problems does not contradict with theoretical research. The research of realistic problems must be guided by the theory of ecological economy. Some special research work concerning the basic theory of ecological economy is necessary. Our understanding of the law of ecological economy should be gradually deepened. On the basis of constant research, we must gradually establish socialist ecological economics with distinctive Chinese features. Whether in the research of basic theory, there is ample scope for the abilities of the research workers of ecological economy. The China Society of Ecological Economics should widely organize the forces of the whole country in this field to participate in this work. We are now drafting the Seventh 5-Year Plan. The experts and professors of the Society of Ecological Economics should also actively participate in the drafting of the

Seventh 5-Year Plan. They should put forward proposals on ecological economy and ecological balance so as to ensure the scientific nature of the draft plan. I hope that the society of ecological economics will make studies and take into account the construction of our country from the angle of ecological economy and make a contribution to the building of socialist modernization.

Ecological economics is a frontier branch of learning that integrates ecology with economics. While studying and solving the problem of ecological economy it is necessary to link the two branches of learning and the scientists of the two fields. It is a need of social and scientific development to integrate social science with natural science. The China Society of Ecological Economics should establish close links with the vast numbers of social and natural science workers, promote close cooperation, carry forward the good beginning we have initiated today, make common efforts, and attain more achievements. They should also actively carry out academic exchanges with and learn from the advanced experience of the international society, raise the scientific level of our country, and serve our socialist construction.

While carrying out research work on ecological economy we should combine the research made by experts with that of the masses. At present, the number of specialized personnel engaged in research of ecological economy in China is limited, which cannot meet the demands of our economic construction. From now on we must strengthen the building in this field, establish and enhance special research institutions, appropriately organize research personnel, pose key topics for discussion, expand the sphere of research, and promote the development of ecological economic research forces. Meanwhile, the society of ecological economics should give full play to the role of academic mass organizations, adopt a variety of forms to organize the comrades who are keen on the research of this new branch of learning and the comrades in the scientific research, education, and practical work departments who are related to the work of ecological economy, and do a good job on mass ecological economic research work by carrying out a variety of academic activities, engaging in information work, running periodicals, and so on. For this reason, the society should also enhance the building of itself.

2. It is necessary to establish and perfect ecological economic legislation.

There are articles in the new PRC Constitution concerning the protection of natural resources and ecological environment. Meanwhile, we have also drafted laws and regulations concerning the protection of the environment and forests, the work of water and soil conservation, and so on. However, these are not sufficient. We must gradually supplement and perfect the things we lack. The problem to be noted at present is that the laws are not strictly enforced and followed. In spite of the interests of the whole, some units and individuals are concerned only with their own interests. As usual, they reclaim steep slopes, indiscriminately cut forest trees, catch baby and mother fish, and discharge the "three wastes." Such a state of affairs must be resolutely curbed and not allowed to go unchecked. Leading cadres at all levels should earnestly undertake this responsibility. The political and legal departments should seriously handle cases that violate the law and conduct education among the masses through typical cases. The units and individuals who have achieved good

results in ecological economy and who have done a good job in protecting the environment must be promptly commended and awarded.

3. Train talented people for ecological economy, strengthen publicity and education.

In the past we did not take note of training talented people for the field of ecological economy. Although some institutions of higher learning have recently offered ecological economics courses, there are no special faculties for this branch of learning. Ecological economic work covers much ground and needs large numbers of talented people. It is quite obvious that the present state of educational work in China cannot meet such a demand. From now on we must strengthen the educational work in this field. The institutions of higher learning concerned should offer ecological economics courses. The institutions of higher learning that have the conditions should set up ecological economics faculties or specialists to train graduates and postgraduates. We must begin education of ecological economy from kindergarten and set up ecological economy courses in primary and secondary schools. Lectures on ecological economy should also be given in various part-time schools and cadre training classes.

Ecological environment and economic development are closely related to every person. Therefore, the problem of ecological economy is a problem of a mass character. It is necessary to strengthen education and publicity so that everyone knows and shoulders the responsibility in protecting nature and improving the ecological environment. In the past our leading cadres neglected this problem because they lacked knowledge of the matter. Therefore, it is necessary to strengthen education and publicity among cadres. Our press, popular science books, radio, television, and films should also frequently publicize ecological economic knowledge, problems, and typical examples. Only when scientific knowledge is mastered by hundreds of millions of people and turned into mass action can there be a fundamental turn for the better in our ecological environment.

CSO: 4008/313

WAN LI ADDRESSES ECOLOGICAL ECONOMISTS 20 FEB

OW201954 Beijing XINHUA in English 1635 GMT 20 Feb 84

[Text] Beijing, February 20 (XINHUA) -- Vice-Premier Wan Li today stressed the importance of tackling ecological problems in building an advanced economy in China. Addressing a national meeting of ecological economists, the vice-premier cited the deteriorating ecological situation as one of the most serious problems facing China in its socialist construction. He urged nationwide efforts to arrest the deterioration and improve the ecological enviroment radically.

Improvement of ecological conditions is not only an economic problem but an issue concerning the survival and development of the nation, Wan Li said. China must work hard to catch up, he added.

Wan Li stressed that education in ecological economics must start in elementary school, and relevant courses should be set up in universities.

He said that advanced experience developed by other countries in ecological economics should be studied and that Chinese ecological economists should participate in the formulating of national economic and social development plans.

The on-going meeting is sponsored by the Institute of Economics, the Institute of Agricultural Economics, the Environmental Protection Bureau of the Ministry of Urban and Rural Construction and Environmental Protection, the Chinese Society of Ecology and the National Committee of the "Man and the Biosphere" Council of China. Opened on February 14, the meeting is attended by 150 natural and social scientists, professors and field workers.

Among the subjects being discussed are the interrelations between a salubrious ecological environment and the modernization of the economy, the internal laws governing these relations, which are significant for a favorable cycle of the ecological economy and a steady growth of socialist construction.

The meeting set up a Chinese Society of Ecological Economics yesterday, and Professor Xu Dixin, 77, a well-known economist and advisor to the Chinese Academy of Social Sciences, was elected president of the 79-member council.

CSO: 4010/82

BEIJING REVIEW STRESSES ENVIRONMENTAL PROTECTION

HK020548 Beijing BEIJING REVIEW in English No 8, 20 Feb 84 pp 4,5

["Notes From the Editor's" column by Xin Kun, social editor: "Editorial Protection To Be Tightened"]

[Text] At the second national conference on environmental protection, which closed last month, protecting the environment was declared to be a basic state policy and an important task in the ongoing modernization drive.

The conference called on state departments and governments at all levels to place environmental protection high on their agendas as a vital issue concerning the people's fundamental interests. Only by making ceaseless efforts can China basically control environmental pollution, restore the ecological balance and create a desirable environment in both urban and rural areas by the end of this century.

Environmental pollution, which is a major problem the world, and particularly the developed countries, faces today, is a big challenge to China's socialist construction. This being the case, apart from vigorously developing its industry, agriculture, national defense and science and culture, China must also appropriately solve its population and environmental protection problems.

For a long time after the founding of the People's Republic in 1949, we lacked a correct understanding of the population problem, which resulted in the overgrowth of our population. It was not until the 1970's that we began to tackle this problem by enforcing family planning.

Similarly, we did not give due attention to environmental protection. If we continue to ignore this problem, environmental pollution and damage to the ecological balance will, like the population problem, land the nation in a difficult position.

Since the first national conference on environmental protection in 1973, an environmental protection network has been set up throughout the country, with some good results, particularly in recent years.

More than 80 percent of the 167 seriously polluting enterprises cited by the state in 1979 have already been dealt with. More than 11,000 polluting enterprises have been closed, merged or removed. Work to control soil erosion is

underway on 410,000 square kilometers, or 34 percent, of the country's 1.2 million square kilometers of land with erosion problems. Water pollution has also been reduced. Pollution caused by oil and heavy metal over large areas of the Bohai and Huanghai Seas has been brought basically under control. The monthly amount of dust falling on Shanghai has dropped from 48 tons per square kilometers in 1979 to 28 tons now.

But, environmental pollution and ecological imbalance are still getting worse in some regions, because many localities and departments have not paid enough attention to this work. Urban industrial pollution is spreading to towns and rural areas, and indiscriminate felling of trees and the desiccation of grasslands continue.

In view of this, the Chinese government has decided to adopt forceful measures to gradually eliminate environmental pollution and improve the people's living conditions. They include:

--Insure the simultaneous development of economic construction and environmental protection. Environmental protection measures should be included in all plans concerning the nation's immediate or long-term economic and social development, and no effort should be spared to insure their implementation.

--Combine the prevention and control of industrial pollution with enterprises' technological transformation. Currently, because our scientific and technological level is not high and the equipment and techniques of many enterprises are backward, many of our valuable resources have not been exploited but discharged as waste gas, water and slag. The various enterprises should, through technological upgrading, promote multipurpose utilization of raw materials and reduce the discharge of these wastes, so as to achieve better economic results and protect the environment. Rural commune- and production brigade-run enterprises causing serious pollution should be cleaned up within a fixed time. Some will be shut down and some switched to make other products.

--Combine environmental protection with the rational tapping of agricultural resources. Each locality should develop its farming, forestry, fishery or livestock breeding according to its own conditions, so that agricultural resources can be used rationally and the ecological balance maintained. Emphasis will be put in developing pesticides with low toxic residue to limit chemical pollution. Chemical fertilizers should be applied rationally and the use of night soil as fertilizer should be maximized.

--Strengthen management. In many places, environmental pollution is linked to poor management. Good results can be attained through better management. Urban noise control is one example.

--Tighten up laws and regulations. The Constitution of the People's Republic says, "The state protects and improves the living environment and the ecological environment, and prevents and remedies pollution and other public hazards." The Chinese government has already published the Environmental Protection Law

and the Law on Marine Environmental Protection. Ten more such laws and regulations, including the Law on Prevention and Control of Water Pollution, the Law on Prevention and Control of Air Pollution, are being drafted or have been submitted to the authorities for approval. These are part of the efforts to build up a complete system of environmental protection laws and regulations.

CSO: 4010/75

FOCUS OF ENVIRONMENTAL PROTECTION SHOULD BE 'PREVENTION'

Beijing RENMIN RIBAO in Chinese 4 Jan 84 p 2

[Article by Qu Geping [2575 2706 1627]: "Environmental Protection Requires Implementing the Principle of Giving Priority to Prevention"]

[Text] Developing environmental protection undertakings with a Chinese character requires carrying out the principle of giving priority to prevention. It requires overall planning and rational distribution. New construction projects must pay attention to controlling pollution and preventing environmental damage. We must do a good job of comprehensively handling accumulated environmental problems.

Our nation has accumulated tremendous environmental problems. Solving these problems will not be easy, will require tremendous financial and material resources and will only be possible through long, hard work. At the same time, we also face large-scale economic construction, and controlling new pollution will also require the expenditure of tremendous financial and material resources. Ours is a developing nation, with hundreds of industries "awaiting prosperity" and with limited financial resources. Therefore, when setting our environmental goals, we must start from China's actual conditions and suit them to the economic and technical capabilities of the nation.

We still need to guard against another tendency, that being to "take your time." This is a belief that developing the economy is the pressing task and that it will not be too late to work on environmental protection after the economy has improved. Those with this belief do not understand the cause and effect relationship between economic development and environmental protection. "First pollute and clean up later" has already proven to be unfeasible. We should have a sense of urgency regarding environmental problems. We can no longer "take our time" in solving environmental pollution problems.

In order to harmonize the relationship between economic and social development and to develop environmental protection undertakings with a Chinese character, it is most important that we carry out the principle of giving priority to prevention. This principle involves adopting preventive measures before the fact, preventing the occurrence of environmental problems or

keeping environmental problems within permissible limits. This can greatly reduce harm to human health and to the economy when compared with being forced to clean up after environmental problems have been created. In addition, there will be a great savings in environmental investments, and environmental benefits will be much greater. Management of the environment should proceed to develop from passive reaction to active prevention.

The major critical item in carrying out the principle of giving priority to prevention is overall planning and rational distribution. This requires that economic and social development attend not only to economic laws but also to ecological laws. Of course, because our nation covers a vast territory with each region having vastly different natural environments, it is difficult to establish concrete plans for the nation as a whole. But in terms of a single city, overall planning and rational distribution are completely feasible.

Overall planning means that in the long-term comprehensive planning of a city, a region or an industry and in the stage-by-stage planning of national economic and social development, we must consider environmental protection, incorporate targets related to preventing pollution and environmental damage and maintaining the ecological balance and rationally distribute industry, agriculture, animal husbandry, forestry, fishery and urban activities as well as other tasks. In terms of a single city, this means designating zones by function based on different ecological conditions--such as residential areas, convalescence areas, scenic areas, cultural and educational areas, commercial areas, industrial areas, etc.

At present, the layout of our nation's cities is irrational. In particular, pollution and damage created by the irrational distribution of industry is striking. We now face the following situation: if we want to improve the environmental quality of cities, we must remove plants that seriously pollute from residential areas, scenic tourist areas and water resource areas. We must shut down factories that we have worked hard to build and build new ones, paying out twice the investment in each factory and wasting precious time. This is the price we pay for ignoring environmental protection and rational distribution. Hangzhou and Suzhou and other areas do not lack such examples.

Strictly controlling new pollution and environmental damage is an important measure in carrying out the principle of giving priority to prevention. Every year, our nation begins a large number of new construction projects and each must strictly implement the regulation on environmental impact assessment and the "three simultaneous efforts," so that after a new construction project is made available to users, it meets the environmental standards laid down by the state. We must quickly reach a state where no new construction project leaves a legacy of environmental problems and creates new debts.

In terms of cleaning up the tremendous environmental problems that have accumulated over several decades, we must first adopt remedial measures to deal with the basic source of environmental destruction, controlling the source of pollution and reducing its damage. Measures to deal with the

results of pollution damage come next, since they are a necessary supplement to prevention measures.

There are many factors contributing to environmental pollution and damage. Therefore, we must implement comprehensive treatment, applying various measures and methods that will enable us to control pollution and environmental damage. Only by firmly adhering to comprehensive treatment can we see that industrial discharge meet national standards and that our nation's environmental protection tasks gradually reach new levels.

9705
CSO: 4008/116

TEN YEARS OF ENVIRONMENTAL PROTECTION BEARS FRUITS

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 12, 1983 pp 2-3, 16

[Article by Ya Ping [0068 1627]: "Environmental Protection Makes Major Progress in a Decade"]

[Text] Controlling Industrial Pollution

Most seriously polluting enterprises, particularly large and medium-sized ones, have taken control measures to alleviate pollution to varying degrees. Of the 167 major sources of pollution designated by the state in 1979 for treatment by a certain date, over 80 have been dealt with. So have a majority of those designated by provinces, municipalities and autonomous regions. According to incomplete data, over 55,000 projects were scheduled for treatment, 36,700, or 67 percent, have been completed. The daily capacity for treating sewage rose by 7.85 million tons, the hourly capacity for treating waste gas, by 93 million cubic meters, and the annual capacity for treating waste residues, by 27.5 million tons. So far we have achieved an industrial sewage treatment ratio of 17 percent and a waste integrated utilization rate of 24 percent. In conjunction with industrial readjustment, we closed, suspended, combined or modified in 1981-82 over 1,100 enterprises which consumed too much energy, were wasteful and were serious polluters. Such actions were not only economically meaningful, but also improved the environment in some areas. In the past two years, as a result of the need for pollution treatment, an environmental protection industry has been taking shape, with over 1,000 design, research, and production units. Each year they turn out 342,000 pieces of equipment, valued at 1,000 million yuan.

Protection of the Ecological Environment Reaps First Fruits

The state has taken a variety of measures to stop the destruction of forest resources and mobilize the entire population to plant trees everywhere and make the country green. According to statistics, civilians and soldiers in urban areas planted more than 60 million trees in the past two years, afforesting almost 130 million mu, and created 39.2 million square meters of shelterbelt in the "Three Norths" alone, which serves as a barrier to desert encroachment. In recent years, a large-scale water and soil preservation campaign has been under way across the nation. Over 70,000

square meters have been treated in the Huang He River basin, which accounts for 17 percent of all the land afflicted with soil erosion. Anti-pollution efforts at the Guanting Reservoir, Ji Canal, Baiyangdian Hu and Ya'er Hu have produced fairly good results. Because control measures have been taken, pollution has become less serious in the Chang Jiang, Zhu Jiang, Huang He, Huai He, and Songhua Jiang and the Bo Hai and the Yellow Sea. The serious mercury pollution in the Jilin Jiang section of the Second Songhua Jiang has been brought under control. After four years' hard work, 186 key treatment projects have been completed in the Bo Hai and Yellow Sea, basically curbing the oil and heavy metal pollution affecting large areas there. There has been a marked improvement in the quality of water in the Liaodong, Bo Hai, Laizhou, and Jiaozhou Bays. Some marine species, on the verge of extinction, are slowly showing signs of recovery. To protect species resources, China has set up 106 nature preserves of various kinds, which make up 0.4 percent of the total area of the nation.

Environmental Research and Monitoring Initiated; Environmental Education Strengthened

The national environmental protection system has set up 85 research institutes at the provincial and municipal levels. The Chinese Academy of Sciences, the Chinese Academy of Social Sciences, and institutions of higher education have established 78 environmental research institutes and offices. The central authorities have set up 79 institutes, offices and groups. About 7,200 professionals are doing research in this area. These form the beginnings of a basic contingent capable of conducting multidisciplinary comprehensive research. It has already achieved much in the past few years in both fundamental theories and applied techniques. According to statistics, about 1,000 research projects have been completed.

Environmental education has been strengthened. At present 23 colleges or universities have set up environmental engineering departments or specialties in environmental protection. Environmental protection has also been expanded in the curricula of other specialties in colleges and in middle and primary schools. Basic knowledge in environmental protection is thus being popularized.

Environmental monitoring has been developing rapidly. Environmental protection departments at various governmental levels have set up more than 650 monitoring stations, of which 394 are above the local and municipal levels. Other departments and certain key enterprises have also established equivalent stations. Rudimentarily, they make up an atmospheric monitoring networking, based on large and medium-sized cities, and a water quality monitoring network focused on river systems and sea areas. Between them, they collect 1.2 million pieces of routine atmospheric monitoring data and 3.12 million pieces of water quality monitoring data every year. Surveys on pollution sources have also been undertaken, and files created on them to provide a basis for a better understanding of the nation's environmental condition and to strengthen environmental management and scientific research. Since 1981, 61 cities have successively compiled reports on environmental quality. These reports form the basis for the 1981 and 1982 editions of the "Report on the Urban Environmental Quality in Certain Parts of China."

Environmental Management System Takes Shape; Environmental Management Strengthened

At present, environmental protection organizations have been set up at the national, regional, municipal and, in some cases, county levels as a functional part of government to be responsible for protecting the environment nationally or in the locale. We thus have an environmental protection contingent of a definite political and professional quality. According to 1982 statistics, this contingent comprises 26,771 people, of whom scientific technical personnel account for 41 percent. Economic departments of the central authorities and a small number of provinces, municipalities, autonomous regions, and some corresponding large and medium-sized enterprises have also set up environmental protection units. Environmental protection planning and management have been improved in the past two years, especially after the fifth session of the Fifth People's Congress passed the "Sixth 5-Year Plan" making environmental protection one of the ten basic tasks of economic social development. The plan puts forward the objectives and requirements of environmental protection and specifically lays out sections and chapters on environmental protection, integrating environmental protection into the plan for national economic and social development. To prevent the development of new sources of pollution, the National Planning Commission, the Economic Commission, the Construction Commission, and the environmental protection leading group of the State Council promulgated in 1980 the "Environmental Protection Management Regulations for Capital Construction Projects", which requires that new construction, expansion and modification projects compile and submit environmental impact reports. These reports must be examined and approved first before construction begins. The "Regulations" also stipulate that environmental protection facilities be designed, built, and put into operation (hereafter referred to as the "three simultaneous efforts") with the principal part of new building projects. In 1982, about 75 percent of capital projects complied with the "three simultaneous efforts". To help enterprises strengthen their management, conserve and use resources in an integrated way, control pollution and improve the environment, the State Council promulgated in February 1982 the "Provisional Measures for the Levying of Waste Discharge Fees", putting into practice nation-wide a system of levy for waste charge. According to 1982 data, altogether 500 million yuan were collected in such fees, of which 54 percent were devoted to helping enterprises combat pollution. Waste discharge levies contributed 137 million yuan, or 34.8 percent of total investments, to the 1,323 pollution control projects that Liaoning Province invested in. They increased the enterprises' capacity to deal with pollution and sped up their pace in doing so.

Environmental Protection Legislation Makes Headway

The promulgation of the "Environmental Protection Law (Provisional) of the People's Republic of China" by the People's Congress was followed by the issue of the "Marine Environmental Protection Law of the People's Republic of China." Environmental protection and ecological balance were thereby legally defined. Environmental protection and the ecological balance are legally defined in the "Forest Law (Provisional) of the People's Republic

of China" and the following laws now being drafted: the "Grassland Law", the "Marine Resources Law", the "Mining Resources Law", the "Urban Planning Law", and the "Land Law". Laws being drafted by higher authorities include the "Law On Prevention and Control of Water Pollution", "Law on Prevention and Control of Air Pollution", "Law on Control of Urban Noise", Nature Preserve Regulations, and Wildlife and Plant Protection Regulations, etc. Integrating their local or departmental conditions, various provinces, municipalities and autonomous regions and several departments under the State Council have also issued rules and regulations. Furthermore, the state has promulgated atmospheric waste and noise pollution standards and a set of sewage discharge standards. Most encouragingly, the new constitution passed by the fifth session of the Fifth People's Congress states clearly: "the State protects and improves the living environment and ecology, prevents pollution and other public hazards," thus ensuring the legal status of environmental protection in the highest law of the land.

Environmental Quality in Key Cities Has Improved

Since 1979, the state designated 22 cities, including Beijing, Shanghai, Hangzhou, Suzhou and Guilin as key environmental protection cities. One after another, these cities have drawn up environmental protection plans, integrated urban transformation and construction, readjusted some irrational layouts, built a number of environmental engineering works, and launched an extensive campaign to modify boilers and kilns. At the end of 1982, 36 urban sewage treatment plants had been built, with a daily combined capacity of 700,000 tons; 45,222 boilers and kilns had been modified, which made up 48.1 percent of the total. In the past three years, an additional 38,000 square meters in and around the cities were planted with trees. At present, afforested areas make up 15.5 percent of overall urban built-up areas. The seven rivers in Beijing municipality, including the Tonghui He, and Lianhua He, were heavily polluted in the past. Today the amounts of toxic substances in the rivers, such as phenol, cyanogen, chromium and chlorine, have dropped by 45 to 48 percent compared to 1974. In 1979, the monthly atmospheric dust in Shanghai municipality was 48 tons per square kilometer. It dropped to 28 tons in 1982. Hangzhou City completed an anti-pollution project in 1981, which markedly improved the water quality in Xi Hu. To reduce pollution in the city, Suzhou relocated over 50 factories outside the city. Ten are in the process of moving out. Guilin City closed 10 factories which had severly polluted the Li Jiang and damaged the landscape. As a result, both the water and the landscape have revived. Lanzhou was hard hit by pollution in the past and there had been outbreaks of smog. The city then proceeded to modify its boilers, centralize fuel supply and make available low-sulfur coal for civilian use. The result: a drop in the amount of sulfur dioxide and nitrogen oxide in the atmosphere to below the nationally prescribed standards. Through the joint production of thermoelectricity and a centralized supply of heat, Shenyang City managed to lower the amount of air-borne dust in the atmosphere in the heat-supplying area from 1.413 mg to 0.49 mg per cu. m., and sulfur dioxide, from 0.154 mg to 0.054 mg.

12581
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THREE APPROACHES TO ENVIRONMENTAL POLLUTION OUTLINED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 12, 1983 pp 4-6

[Article by Guo Zuyuan [6665 4371 3293]: "Liberate Ideology, Be Realistic, and Unite to Protect the Environment"]

[Text] It has been ten years since the first national environmental protection conference in 1973. During the past ten years, China's environmental protection work has made considerable achievements. However, as we review our record and look forward to the future, we should realize that like other areas of economic and social life, environmental protection had for a long time been subjected to the influences of leftist mistakes which are far from being eliminated. As Comrade Hu Yaobang said at the memorial service marking the centenary of the death of Karl Marx, "the time has come for us to unequivocally resolve to uproot this problem." Combining this with Comrade Deng Xiaoping's instruction that we should "liberate our ideology, be realistic and unite for the future," I believe the reform of environmental protection should be tackled in the following three ways:

I. Liberate our ideology, and eradicate the grave influence of the leftist error of taking a one-sided approach to environmental protection

The 6th Plenary Session of the 11th Party Congress resolved that the "focus of party and state activities must be shifted toward socialist modernization centered around economic construction. We must go all out to boost productivity and, on this basis, improve the people's material and cultural life."

Concerning environmental protection, Premier Chou had repeatedly pointed out since 1970 that we must practice comprehensive utilization if we are to remove the "three wastes." He called comprehensive utilization a formidable task and urged us to commit ourselves to surpassing world standards. He also made "integrated planning, rational distribution, comprehensive utilization, and turning harm into good" the core of our environmental protection objective. However, as a result of the Gang of Four's sabotage, interference, and influence during the ten years of internal turmoil, industrial and mining enterprises ignored economic accounting and mistakenly thought that "comprehensive utilization amounted to not doing one's job."

After the Cultural Revolution, the state passed the National Environmental Protection Law in 1979, reaffirming the policy of "protecting the environment and benefiting the people through integrated planning, rational design, comprehensive utilization, turning harm into good, relying on the masses and working together." Unfortunately, many people still fail to adhere to the principle by exclusively emphasizing ecological balance. They ignore China's economic capability and demand that the state increase its budgetary allocations for environmental pollution control. In addition, they disregard economic results and are blind to the environmental pollution caused by the extensive loss of energy and other resources in the production process. To judge by some key economic indicators, our performance not only lags behind that of advanced countries but also falls short of what we had achieved in the past. This shows that in the production process, our potential to economize and fight pollution remains tremendous. In 1981, after Comrade Zhao Ziyang ordered the popularization of the pioneering experience of the Anshan Iron and Steel Company which self-reliantly practiced comprehensive utilization and tackled the "three wastes," there sprang up across the country a number of progressive units which are doing well both economically and environmentally. To further develop production, improve the people's livelihood and improve the urban and rural environment, we must liberate our ideology, uproot all leftist errors and pernicious influence, and conduct our affairs in accordance with the dictates of economics, nature and science, realistically achieve our national economic plan and ceaselessly increase economic, social and environmental results.

II. Realistically and correctly deal with economic results and social and environmental benefits; and unify the relationship among economics, science and technology, and management

A. Every activity should be subordinate to and serve economic construction and the improvement of socio-economic results. Environmental protection is no exception. If environmental protection workers care only about the environment and ignore economic factors, and vice versa for people in the enterprises, they would be violating the resolution of the 6th Plenary Session. The environmental protection department should discard the old practice whereby they calculate the percentage by which the environmental quality of an area or enterprise exceeds the prescribed standard and the funds required to treat pollution. Instead they should indicate in their accounts the economic losses, both external and internal, caused by pollution and the economic results that result from treatment. In this way, economic results, and social and environmental benefits are integrated. This practice should be followed in both environmental education work and environmental planning.

Production departments should correct their old single-minded preoccupation with output volume and output value and their mistaken disregard of costs, quality and economic accounting. Economic accounting should take into consideration the cost of a piece of merchandise not only before it leaves the plant but also through storage, circulation, sale, use and maintenance, including the cost as it affects the environment, human health, and the ecology. Compared to enterprises, urban construction departments pay more

attention to the internal direct and indirect economic accounting of a project but they share the enterprises' lack of regard for its external social, economic and environmental impacts.

Enterprises, urban construction departments and environmental protection departments should make comprehensive construction plans and select the course of action that makes the best integrated economic sense. When partial interests clash with general interests, the former should yield to the latter to ensure the national good. When the difference between price and value is too great, economic accounting should analyze the cost result of energy. In energy-short areas, we must calculate how energy affects industrial output value. One kilowatt/hour of electricity increases the cost of light industry by 3-5 yuan, so we cannot think in terms of cents only when electricity consumption is high.

The "Regulations on Shortening Construction Time and Improving Economic Results," promulgated last year, state that "all projects must realistically calculate economic costs even when the projects are being built. Any construction project with economic results must give a date in its design and planning documents for the recoupment of the capital outlay." This requirement must be firmly enforced. Everybody is duty bound to practice strict economy and oppose waste in order to protect the environment. And there is certainly a lot we can do here.

B. The integrated system of economics, science and technology and management

These three parts are inseparable. The economy is the end, science and technology the means, and management the medium. Concerning the education of cadres, Comrade Deng Xiaoping has instructed us thus: "One studies economics, one, science and technology, and one, management. Only by mastering these skills can we lead a socialist modernization drive that will be rapid and superior." Be it economic construction, urban and rural construction, or environmental protection, we must strengthen supervisory management. However, only the kind of management that fits China's condition, makes use of advanced technologies, and conducts affairs in accordance with economic principles, will produce practical reliable economic results. On no account could we exclusively emphasize administrative managerial procedures and ignore scientific methods, and economic objectives and means. Moreover, the relationship between environmental protection agencies and enterprises in China differs from that in capitalist countries. Since enterprises presently lack the technology to combat pollution, it is the responsibility of the regulatory agencies not only to urge the enterprises to do so, but also to help them solve technical and fund-raising problems. The proper way to combat pollution is to follow the objectives of environmental protection and the economic principles of management. Full consideration must be paid to the improvement of technology, the reduction of the "three wastes," integrated planning and comprehensive utilization. Then a careful choice must be made between dispersed treatment and centralized treatment so as to comply with the local standards for waste disposal. In drawing up such standards, a locale should follow

basic national industrial standards, make full use of the self-purification capacity of the local environment, accommodate the claims of public health, ecology, safety and aesthetics as much as possible, and adopt practical and economical advanced technologies in order to obtain the optimal social, economic and environmental results with the least expenditures.

There should be two sets of standards for the disposal of industrial sewage. One set governs non-biodegradable substances and cannot be exceeded. Such substances must be treated by the offending unit within a certain time. The other set of standards governs biodegradable substances and can be exceeded. This kind of sewage can be pooled with urban sewage for centralized treatment but the offending unit will be charged for the excessive amount. The money thus collected will subsidize the sewage treatment operations of the construction departments. Thus, dispersed treatment, which is wasteful, is avoided. The extent to which urban sewage is treated should depend on the locale's demand for recycled water. This is an instance of economically rational scientific management.

To strengthen management in accordance with economic principles, a variety of incentives and penalties is needed to supplement the above practices. Incentives and penalties are important. They could eliminate the mentality of "eating from the same big pot," and mobilize everybody's creativity and initiative. At the same time, any unit or small group which seeks to protect its own interests in the name of reform, thereby damaging the interests of the state and people, must be ruthlessly dealt with.

III. Strengthen the cooperation among production, urban and rural construction and environmental protection

These three issues are intimately related.

According to the ten objectives of economic construction, the restructuring of enterprises must be carried out in conjunction with their readjustment and reorganization. First, enterprises which consume an excessive amount of energy and raw materials, have long been running a deficit, cause a great deal of pollution, and whose products are shoddy and unpopular, must be closed, suspended, merged or modified, as the case may be. This is to enable China's limited resources and raw materials to be used by those enterprises whose products are superior, whose consumption is low, and which produce good economic results. According to a State Council regulation, funds for anti-pollution projects that combine technological tranformation and complete sets of purification plants should be integrated into the plan of the enterprise, the locale or the state. Such funds should be drawn from the depreciation funds, profits that the enterprise is allowed to keep, the product development fund, maintenance funds, waste discharge fees, state budgetary appropriations, bank loans and foreign capital. All necessary equipment and materials are to be integrated into the technological transformation plan and dealt with accordingly.

From the viewpoint of urban and rural construction and environmental protection, "urban and rural integration" and "industrial and agricultural

integration" are consistent with "integrated planning" and "rational distribution"; so are "benefit production," "make life easy," and "multipurpose use" and "turn harm into good." They fully demonstrate the importance of the inter-dependency among production and construction, urban and rural construction, and environmental protection. We must, therefore, strengthen leadership to succeed in these endeavors.

The 1980 national urban construction planning conference resolved that it is the "chief responsibility of a mayor to properly plan, construct, and manage a city." Recently, the central authorities have approved the "Overall Urban Construction Plan for Beijing Municipality" and put forward ten principles in its official response. To strengthen leadership, it also decided to set up a capital construction committee comprising the Beijing mayor as chairman and responsible personnel from relevant departments at the national and local levels as members. After studying the written response, I propose that a consulting group, six special committees, two key industrial zone reform planning committees, and four satellite urban construction planning committees be set up under the capital construction committee in order to increase its capability and its ability to fully exert its authority. The respective jurisdictions of the six special committees are: 1) the re-building of the old city; 2) economic readjustment; 3) municipal works; 4) cultural, educational and athletic affairs; 5) afforestation; and 6) structural reform. These plans must be carried out simultaneously if comprehensive planning and coordinated development are to be possible. As locales seek to readjust their economies and undertake urban construction and environmental protection, they must break free from provincialism and fully consider the establishment of joint enterprises which would make comprehensive use of the three wastes of industry and agriculture in the manufacture of by-products. In drawing up the "Sixth 5-Year Plan" and "Seventh 5-Year Plan," they must incorporate the enterprises' substantive regulations and adopt advanced techniques. It is then up to the relevant department to set up a prototype factory, and the environmental protection department to organize professional training classes. New factories are to be built, and old ones transformed, rationally. These efforts are a major contribution to changing China's backward environmental outlook and achieving socialist modernization and national strengthening.

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QU GEPING DISCUSSES POLICIES, OBJECTIVES FOR ENVIRONMENT

Beijing HUANJING BAOHU [ENVIRONMENT PROTECTION] in Chinese No 10, 1983 pp 2-5, 30

[Article by Qu Geping [2575 2706 1627]: "Problems on the Policies and Strategy for Environmental Protection in China"]

[Text] Editor's note: Currently, all regions and all departments in the country are making long-term plans for environmental protection. Comrade Qu Geping's previous article, "Basic Characteristics and Major Lessons of Environmental Problems in China," was published in the No 8 issue of this journal. For our readers' reference, we now publish his paper on the policies and strategy for environmental protection.

Comrade Deng Xiaoping has pointed out, "In our modernization program, we must proceed from China's realities ... blaze a path of our own and build socialism with Chinese characteristics--this is the basic conclusion we have reached in summing up long, historical experience"("Selected Works of Deng Xiaoping," pp 371, 372). What are the characteristics of environmental problems in China? We have observed that our problems are different from those of the advanced industrialized nations and also from those of the developing countries. There has not been a successful model which we can adopt. It has been widely admitted that the path of "Polluting first and cleaning up later" as practiced in many industrialized countries did not work. The clean and beautiful "post industrialized age" model as presented during the latter part of the 1970s was merely "wishful thinking." Professor Julian Gresser of Harvard University, during the 1982 lecturing tour in China said, "China has to formulate her own environmental protection policies because there has not been any success story which is worth adopting." There is no other alternative for us but to blaze a path of our own concerning environmental protection. After 10 years of study, our accumulated experience now enables us to step out of pure theoretical discussions. With improved understanding, we are now in a position to formulate correct guiding principles.

To set viable environmental strategic objectives, we need to have a correct goal. What is the guiding ideology, or, the key points for our environmental strategy? The following four points should be included in the guiding principles: 1) We need to have a realistic understanding of the scale of the hardship and the financial, material and human efforts needed to deal with the accumulated environmental problems. Facing large-scale economic construction, a large

amount of financial and material resources are also needed to control new pollution. Being a developing country embarking on modernization with limited resources, we must be careful not to set our standards too high. We can only start from where we are and use whatever economic and technological means at our disposal, remembering the lessons learned from failing the environmental protection objectives which proposed to "achieve control in 5 years and a solution in 10 years." Overly ambitious demands beyond the economic and technological means of the state can only lead to failure. Nevertheless, to correct the overly ambitious approach, we must not revert to the "Let's do it slowly" path. Many people actually hold this view, thinking that economic development is the most urgent matter, and environmental protection can wait. They do not understand the cause-effect relationship between economic development and environmental protection, these people are actually advocating the roundabout course of the "Polluting first and cleaning up later" which has been repudiated through worldwide experience. By now, we should have felt the pressing need for environmental protection, and set up zealous yet feasible objectives which are compatible with the requirements of the two civilization constructions.

2) We need to implement a policy which harmonizes development with environmental protection. Unlike the private competition for production materials in the capitalist society, there should not be any basic contradiction between development and environmental protection in a socialist society, for both undertakings are meant to benefit the people. An indicator for the successful coordination between development and environmental protection is the unification of economic results, environmental and social benefits. Such a unified point of view should be the gauge for any developmental and environmental protection undertakings.

To achieve good coordination, first, goals of environmental protection and the establishment of standards must meet the basic human health needs and ecological needs. The standard must be affordable for the specified period. Environmental objectives are basically for ensuring healthy economic development rather than for fettering development. Second, all economic development should take measures to meet the requirement of environmental protection. Under no circumstances must we foolishly sacrifice the environment for development. To ensure successful coordination, we must raise people's consciousness for environmental protection, and strengthen planning and management. Other administrative economical and legal measures are also needed.

3) We should adopt a policy of comprehensive treatment, combining prevention with treatment, and putting prevention first. Under the premise of being able to estimate possible environmental damages caused by certain activities, preventive measures can be taken to control and restrict the damage to a certain acceptable limit. Such positive preventive measures cost less in environmental investment than the negative policy of treating environmental problems after they occur. Damage to human health can be reduced. The quality of our environment as observed in a plant, a city, a region and in our entire country, will depend on the implementation of the preventive policy.

Being a developing country pursuing the planned economy course, with large-scale economic construction bearly started, we are at a vantage point for implementing the preventive policy.

Overall planning and rational distribution are essential in the preventive policy. Both economic laws and ecological laws are to be observed in our economic and social development to achieve the coordinated development of our economy, society and environment. Naturally, it is difficult to set any concrete plans on a nationwide scale since our territory is so large and the natural environment varies so drastically from place to place. But we can make overall plans for a city, a region or an industry.

For both overall and separate stage plannings, national economic and social development indicators on prevention of pollution and destruction, and on maintaining the ecological balance are to be set first and then conscientiously pursued. Attempts are being made in many capitalist countries to protect and improve the environment on an overall scale. However, since the production goods are privately owned, difficulties are formidable. Under socialism with predominant public ownership, we are in a better position for overall planning. We must fully utilize the advantage, seriously incorporate environmental protection into the general planning to realize the development of the environment, national economy and society in one accord.

Rational distribution means to arrange the industry, agriculture, animal husbandry, forestry, fishery, urban life, and other undertakings of a city or a region according to ecological conditions. Taking a city as an example, residential area, medical treatment and recuperation area, scenic area, culture and education area, business area, and industrial area are arranged in light of their function.

However, the layout of many urban areas in China is irrational. Irrational industrial distribution causes pollution and damage to be even more noticeable. To face this reality, we have to move heavily-polluting plants situated in the middle of scenic areas or where water sources are located. Wasted financial and human resources are the penalty we have to pay for disregarding environmental protection in the past. An example of such waste is the building of the Hangzhou refinery right at Xi Hu, a well-known scenic area. Even though the plant is conscientious about pollution prevention, and the plant's environmental indicator has reached an advanced standard, due to the irrational choice of its site it should be moved. If the refinery had not been built at Xi Hu, the plant would have been commended rather than rebuked. Similar cases are found in Suzhou, Guilin and Beijing. We are making every effort to correct irrational distribution, and should not repeat this mistake. New industries, including neighborhood industry, must pay attention to rational zoning. We must build new cities that are rational, clean and beautiful.

Overall planning and rational distribution can be achieved only under certain conditions. Among other conditions, the most crucial one is the scientific reliance on an environmental impact assessment system. The environmental characteristics and the environmental capacity (natural purification ability and self-restoration) of a city can be measured by environmental impact assessment. Based on this knowledge, we know what undertakings can be developed

in the area and the volume of the development together with what undertakings should be restricted from the area and the volume of the restriction. Foresight is increased and blindness in development is reduced. The environmental impact assessment system is listed by the state as a component of the feasibility study before any construction. The system has been implemented in the construction items of several regions and has achieved fine results. We intend to extend the use of the system to all regions.

Any discussion on controlling environmental pollution or damage encounters the primary difficulty of obtaining large capital resource. Yet such problems do not exist in our socialist overall planning and rational distribution for environmental protection. Large sums of environment expenditure are saved. The basic policy for environmental protection in our country, and the realization of the uniquely Chinese way in environmental protection are to control pollution and damage, and to improve and protect environment through overall planning and rational distribution.

Strict control of new pollution and environmental damage is the major measure used in implementing the policy centered on prevention. We begin construction on a large number of projects every year. The number of construction projects will increase with the improvement of our economy. All new projects are required to strictly observe the regulations on environmental impact assessment and the "three simultaneous efforts" so that at the completion of a new project, the state environment indicator is also met. The sooner we arrive at the state when no more new environmental problems come into existence, the sooner we can shift our emphasis to solving old pollution problems.

For the large number of accumulated environmental problems, our policy is still "prevention." Remedial measures are adopted to control the source of pollution and reduce the scale of pollution damage. Measures for treating pollution results are only secondary to supplement the preventive measures. The proper use of prevention and treatment offers a correct path for solving our historical environmental problems.

Since the factors contributing to environmental pollution and damage are many and varied, we need a comprehensive treatment policy to mobilize all the methods to put pollution and environmental damage under control. For instance, to prevent industrial pollution, we should regulate the overall arrangement for industry, strengthen enterprise management, proceed with technological renovations, develop comprehensive use, adopt engineering treatment and environmental self-cleaning methods, thus unifying the rational use of energy resources and the pursuit of pollution prevention. By combining environmental management with the economic responsibility system, under comprehensive administration, we should bring industrial emission within world standards.

4) We should implement technological policies conducive to environmental protection. Like economic development, environment protection needs policy and science. Essentially, what causes our environmental pollution is the waste in resource and energy due to the backwardness of our industrial technology. Marx once said, "Different from the economy achieved through the reuse of the refuse from industrial production, there is the economy achieved through preventing the

occurrence of waste. This kind of economy is to reduce refuse to the lowest degree so that all the raw materials and supporting matters used in the production are used to their maximal capacity" (Marx, "Das Kapital," Vol 3, p 95). Consequently, one of the basic measures for preventing pollution and improving the environment is to develop pollution control techniques suitable to China's conditions, use our energy and other resources more efficiently and try to control pollution during the course of production. This measure ensures the carrying out of the environmental policy centered around prevention. The scale of the environmental objective depends on the technological level of the pollution control technology adopted. To set environmental protection strategy and objective, we do not use current technology level as our base. Rather, we attempt to bring our technological and equipment level up to that of the more advanced nations. The new effective pollution control technology used in those countries which are similar to us, and those technologies widely used in the 1970s in the world may be adopted.

Propagating low-pollution or no-pollution technology is in accordance with the mission of technical transformation of the economy. There should be a combined effort toward progress. For this reason, in 1983, the State Council formulated regulations on preventing industrial pollution through technical transformation. The regulations say: "Adapt new technology which can convert material and energy resources into products to the maximum extent possible, and reduce the discharge of pollutants to the largest degree, to replace backward technology which emits large amounts of waste. Obsolete equipment that seriously pollutes the environment and wastes resources and energy should be replaced by new equipment which is quieter, more fuel efficient, and has little or no pollution. Toxic raw materials should be replaced by non-toxic or low-toxic raw materials. A rational product structure should be adopted to develop new products which do not pollute the environment. Industrial product design should meet the requirement of environmental protection. Purification equipment characterized by advanced technology, high efficiency and rational economy should replace low efficient costly equipment which takes up a large space. All projects that undergo technical transformation because of pollution should meet state or regional pollution emission standards." The regulations add: "After technical transformation, all projects that do not meet the standards will not be approved."

The regulations point out, "Plans for technical transformation, should not only take into consideration the benefits of the individual enterprise, industry and department, but must consider the benefits to the overall national economy, Projects that increase production and revenue in the short-term, but cause serious environmental pollution, damage the ecological balance or endanger society and national economic development, should not be included in plans for technical transformation."

The State Council has given clear directions on the general and specific policies regarding preventing industrial pollution through technical transformation. Although addressing current industrial enterprises, the basic spirit of the regulations is applicable to all new industrial enterprises and to other sectors of the national economy. If the regulations are conscientiously carried out, our environmental protection undertakings should be raised to a new level with effective pollution control and environmental improvement.

5) Use our natural resources comprehensively. The large amounts of waste that are discharged during production and every day life become pollutants if discarded, but if properly used become material resources. Marx said, "Within the same production department or in another department, emissions from production can become the major resource for another production" (Marx, "Das Kapital," Vol 3, p 95). Comprehensive utilization is the basis for regarding wastes as material resources.

While drafting plans, it is necessary that we demand development, production and transport departments to reduce discharge. But a certain amount of discharge is unavoidable. Along with economic development and a rising living standard, the amount of discharge will increase and the composition of the discharge will be more complex. Discharge cannot be left alone to pollute the environment or be disposed of carelessly. A positive attitude is to develop comprehensive utilization and convert waste to resources. Waste water, after treatment, becomes a useful resource for industrial, agricultural, fishery and tourist undertakings. Industrial solid waste can be converted into building material, agricultural fertilizers, or used to fill holes, create farmland and forests. Our goal is to transform harm into benefit, and waste into wealth.

Proper economic policies should be established to promote the comprehensive use of industrial and domestic wastes, and natural resources. We can depend on policies to encourage and mobilize the initiative and strength of enterprises, businesses and the society to develop extensive and thorough comprehensive use of wastes and resources. Some exemplary policies are: loans on favorable terms, reduced taxes, profit retaining, breaking boundaries between enterprises, trades and regions, free-of-charge or low charge supply of waste materials, etc.

There has been a fine tradition for developing the comprehensive utilization of wastes. The tradition has been carried forward ever since the founding of New China. Abundant experience has been accumulated and a path for transforming harm into benefit is well trodden. Our present mission is to systematize and summarize our experience, incorporate the experience into our planning and set up both long-term and short-term objectives, to ensure the realization of the planning by a system.

6) Institute an environmental protection responsibility system. In the current economic system of organizational reform, the economic responsibility of each region, department, enterprise and staff member or worker is clearly regulated. This is an important measure for invigorating the economy. To control pollution and improve the environment, we should also specify the environment responsibility of each region, department, profession and unit of enterprise. The 1979 policy of "whoever pollutes is responsible for cleaning up" has proven to be a positive measure, it made responsibility for the environment clear and promoted the prevention and treatment of pollution. Nevertheless, because of the lack of clarity in writing, there has been controversy. Two kinds of misunderstanding arose from the document: First, responsibility for pollution was placed directly on the unit of the enterprise and not on the higher level authority in charge

or the department that approved the polluting task. Facts have proven that without the support from concerned higher level departments, many units cannot complete pollution prevention tasks. Second, pollution prevention is confined to individual units and is not integrated with regional, comprehensive prevention. Under certain conditions, it is neither rational nor economical to require a lower unit to achieve environmental standards. For instance, the treatment of waste water is best dealt with centrally by regions rather than each plant building its own water treatment unit. "Whoever pollutes is responsible for cleaning up" is taken mechanically from the foreign phrase "Let the polluter bear the burden of cleaning up" with some loss of accuracy. Some people prefer to use the original phrase. No matter how the idea is phrased, it should be clear that any enterprise, business, organization or group has the obligation to compensate for the pollution is causes. Depending on the requirement for environmental planning, all groups are organized to realize the objectives set for pollution prevention and treatment. In addition, the environmental responsibility for natural resource development must be regulated. For instance, miners are responsible for restoring the damage caused to the ground environment. Forest fellers are responsible for planting new forests. People who build dams for hydraulic power generation are responsible for the water ecology. Farmers are responsible for protecting the ecology of the natural environment. People who live on gathering and hunting wild plants and animals are responsible for restoring and protecting wild life resources. On the whole, developers should understand that the natural resources and natural environment must be protected during developing, and that proper protection results in better development.

Regulating environmental responsibilities has the following significance: An integral part of socialist construction is to protect the environment and maintain the ecological balance and it is the duty and responsibility of every region, department or trade. To meet the needs for large sums of environmental investment and to mobilize the initiative of all quarters, we rely on contributions from regions, departments, different trades, and enterprises, rather than place financial burden on the state. This is our proposal for the source of environmental investment while formulating environmental protection objectives.

The above principles are formulated from 10 years of experience and continuous exploration and have been proven to be the correct direction for guiding environmental protection work. In order to engage in environmental protection undertakings which are characteristically Chinese we should observe these basic policies.

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DEFINING ENVIRONMENTAL GOALS BASED ON NEED, ECONOMIC PRACTICALITY

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[Article by Li Jinchang [2621 6855 2490]: "Attach Importance to the Quantitative Analysis of Environmental Issues"]

[Text] Quantitative analysis to detect and program environmental protection problems is now fairly common in international usage. In the early and middle periods of the 1970's, the economically developed countries of the United States, Japan and West Germany, calculated that the economic losses from environmental pollution amounted to 3-5 percent of the gross national product, and that expenditure for environmental protection, including pollution prevention and protection of natural resources, accounted for 1-2 percent of the gross national product (in developing countries the ratio is 0.5 to 1 percent). If the gross national product is doubled, the pollution load increases over 20 times, and expenditure to clean up pollution after it has occurred is about 20 times the expense of preventing it before it occurs. Although this data may appear somewhat doubtful as to conditions, reliability and applicability, they did after all provide reference data for economic decisions as to national investment and stimulated the launching of environmental protection work. We have so far no such data in China, and many questions remain descriptions of certain fixed concepts without sufficient convincing power.

To establish environmental protection on a more conscious and more scientific basis, the greatest attention has been paid internationally to analyses of the results from environmental protection expenditure, using the input-output method and environmental econometric models. Many studies and propagandistic activities have been launched. In his statement on the "World Environmental Day" in 1978, directed to all the world governments and their citizens, Dr Tolba, Executive Director of the UN Environmental Program, gave an actual example of a loss-benefit analysis (i.e. an analysis of the effects of expenditure) from a program to prevent desertization. He said that the world loses 60,000 km^{1} every year due to desertization. It would require about U.S.$400 million a year to avoid this frightening loss and to completely stop the spread of deserts, and this expenditure would generate U.S.$1.3 billion of benefits every year, that is over 3 times the needed expenditure. As another example, Japan which used the input-output method and environmental econometric models came to the following conclusion in its loss-benefit analysis of environmental policies and measures: The resolute and strict

environmental policies and measures that had been adopted were of little influence on the macro-economy of the country. The gross national output value after 15 years was reduced by a weak 1 percent, but the benefits in environmental protection and for the state of health of the people were enormous. Exhorting the Japanese government to allocate a large amount of investment for the prevention of environmental pollution has produced excellent results. Internationally, there are many examples for the use of mathematical analyses for the purpose of environmental forecasting. For instance, the Environmental Bureau made the following forecast in the early seventies: In 1975 the world population will be 4 billion and the cultivated area 1.24 billion hectares, or an average of 0.31 hectares of cultivated land per person. Between 1975 and 2000, there will be a loss of 300 million hectares of land due to urban development and other reasons, another 300 million hectares will be lost to soil erosion and soil deterioration, and the amount of new arable land from reclaimed wasteland will also be 300 million hectares. By the year 2000 the population will have increased to 6.253 billion, but the arable land will have declined to 940 million hectares, or to an average of only 0.15 hectares per person, that is to half what it was in 1975. This reveals the problem: While there is the necessity to find ways to reduce population growth, mankind must also exert great energy to maintain all its land resources and protect the material base on which mankind relies for its very existence.

Although the industrial foundation of our country is comparatively weak, we are one of the largest countries as regards discharge of pollutants. We have at present no total figures of economic losses due to pollution, but according to investigations and analyses of conditions in the Xiang Jiang basin of Hunan Province, the economic losses caused by industrial pollution take up 1.56 percent of the industrial and agricultural output value of that area. If we apply this figure to the whole country, we are annually incurring an economic loss of 12 billion yuan due to industrial pollution. Because industrialization in the Xiang Jiang area is not highly developed, if we apply its condition to the whole country it is possibly on the low side. However, the said figure is very substantial (if we would figure at the lowest percentage, namely 3 percent out of the 3 to 5 percent in the case of developed countries, then our total losses would reach 24 billion yuan). In some years past, we used to allocate an annual investment of 100 million yuan for environmental protection, and that made our hearts ache. We hardly realized then that our annual losses due to pollution reached over a hundred times those 100 million yuan. At present, our investment in environmental protection accounts for 0.28 percent of our gross industrial and agricultural output value, and is even below half of the lowest percentage spent by most developed countries (where it accounts for 0.5 to 1 percent of the gross national output value). This situation has to be changed.

Considering the overall situation, the work of quantitative analysis of environmental pollution that is done in our country is quite inadequate. However, in recent years added attention is gradually being focused on this matter. For instance, Comrade Qu Geping [2575 2706 1627] of the Environmental Protection Bureau of the Ministry of Urban and Rural Construction and Environmental Protection has indeed once used the method of quantitative analysis when he discussed the economic and environmental problems of developing and utilizing our coal resources. The gist of his remarks are that our

country produces 600 million tons of coal annually. By burning this coal, as much as 14 million tons of sulphur dioxide are annually emitted into the atmosphere. Apart from the serious pollution and harm to the environment and the health of the people, it also creates acid rain that falls over a wide area of the Chang Jiang basin and over 20 provinces, municipalities and autonomous regions, destroying agriculture and the ecology to a serious extent. In America, acid rain causes loss to the economy amounting to U.S.$25 billion every year, and we estimate that the losses that our country suffers in this respect is also large. Changing the current unreasonable methods of coal exploitation and utilization and turning to comprehensive utilization of coal resources could bring about greatly increased economic and environmental benefits. With an investment of 1.2 to 1.5 billion yuan, we could establish coal washing plants with a capacity of 100 million tons. This could annually eliminate 12 million tons of ash content and correspondingly reduce 5 billion ton/km of transportation, save 1 billion yuan investments for track construction and avoid 500 million yuan dust removal expenses. The coal washing would also eliminate pyrites, which would make extra investment for sulphur elimination unnecessary and provide raw material for industries requiring sulphur. The ash content of coal could be reduced to 1 percent, the calorific content of every kg of coal would be increased by 80 kilocalories and the calorific value correspondingly increased 1.6 percent. That would help save energy and raise economic results. According to statistics, each ton of washed coal could increase the income of the mining enterprise by 5 yuan. By this item alone, the total income could be increased by 5 billion yuan, and in 3 years the total investment for the coal washing plants could be recovered. While actively developing the exploitation of coal, it is extremely necessary that we simultaneously increase our coal washing capacity on a large scale. Furthermore, a Japanese publication reports that assuming emission of sulphur dioxide in Japan to have been 100 in 1975, the emission should have risen to 139 in 1980 according to the intervening industrial developments, but actually it was recorded at only 71. Why the reduction by 68 points? The reasons are: Structural changes in the industrial enterprises accounted for 8 points, energy savings for 28 points, changes in the fuel composition for 10 and additional sulphur removal installations raised the circulation rate and sulphur dioxide elimination, reducing the figure by a further 22 points. Furthermore, taking the amount of oxygen consuming chemicals emitted in Japan in 1975 at 100, it should have increased to 138 by 1980 in the wake of the intervening industrial developments, but actually was recorded at only 84. Why this reduction by 54 points? The reasons are: "Structural changes in the industrial enterprises accounted for 12 points, savings of natural resources for 15 points, adoption of measures to increase the rate at which oxygen consuming chemicals are eliminated, etc. for 27 points. These facts show that while Japanese industry was developing, Japan changed the structure of its industrial enterprises (i.e. increased the proportion of less polluting processing industries and reduced the proportion of heavily polluting basic raw and semi-finished materials industries), saved on energy consumption, changed the fuel composition, increased the equipment for disposing of the three wastes and raised the rate of turnover and in other ways markedly reduced the amount of emissions. All this explains that there is indeed the possibility to develop industry while at the same time reducing pollution.

Quantitative analysis is observing, computing and analyzing things from a quantitative angle and thereby revealing the special characteristics and developmental rules of things. All things have their definite characters of quality and of quantity. The special features of things are not only expressed in the differences of their qualities, but also in the quantitative differences of dimensions, degrees, levels, speed of movements, etc. At the same time, the changes in the nature of things are induced by changes in quantity; they are the product of quantitative changes accumulating to a certain stage. The only way to gain a more accurate perception of things is therefore to use both the quantitative as well as the qualitative analysis. If no attention is paid to the quantitative aspect of things, nor to basic statistics, in particular to percentages, if no attention is paid to determine the quantitative limits of the quality of things, then one cannot have an insight in how things stand, and it will be impossible to avoid committing errors. When studying political economics, our great revolutionary mentor Marx deeply felt that divorced from mathematical analysis, there is no way to reveal the economic laws. In his old age he therefore courageously decided then and there to take up a systematic study of mathematics. Marx left over 1,000 pages of mathematical notes and used algebraic equations to describe the simple reproduction. He used the mathematic inequality to describe in chart form the expanded reproduction. These are the fruits and testimony of his years of painstaking labor of studying mathematics. Engels too made profound studies of mathematics. In such works as his "Dialectics of Nature" he left us his mathematical treatises and brilliant expositions.

However, in our actual work it is still a rather serious occurrence that quantitative analysis is being neglected. In certain investments in capital construction no technological, economic and environmental evidence was worked out, or properly worked out, so that some items showed great economic and environmental deficiencies, some products had no markets, there was an insufficient supply of raw materials, fuel or motive power and some gave rise to serious environmental problems, etc. All this resulted in irreparable losses to the state. Many serious problems had only been considered under qualitative aspects without quantitative measurements and norms. At first glance a project may have stood out as an important item to pursue, but in actual fact it proved impossible to execute. A few years back our country had set up its goal of environmental protection by proclaiming "Control of pollution in 5 years and a solution to environmental problems in 10 years." When establishing this goal, no forecasts and quantitative analyses were made of the actual conditions and developments of environmental pollution in our country, there were no scientific data and the goal itself could not be checked, measured or supervised by means of quantitative norms. Therefore, it was unrealistic, and that the matter was settled by leaving it unsettled.

In view of the experiences and lessons of the past, and to avoid mistakes in policy, the party and state leadership attach the greatest importance to the work of quantitative analysis in our economic construction. They emphasize starting out with quantitative data in the various technological, economic and other types of analyses when arguing and proving a case, and to conscientiously do the preliminary work of feasibility studies in all engineering projects. Recently leading comrades of the Central Committee again pointed out that any

document presented by economic departments for consideration by the State Council that only considers the qualitative aspects and does not contain quantitative analyses will not be discussed. This directive is bound to induce comrades at all levels and in all quarters to pay attention to quantitative analysis, so that every policy decision will be in full knowledge of the situation and that all projects will be of a higher standard of perfection.

To achieve the strategic goal of our country's economic development it is necessary to have a system of directives based on this goal and include a set of quantitative norms to serve as guidelines for leading troups at all levels and to guide economic construction, serving as criteria to measure the quality of work. Based on the long-range strategic goals of economic and social development, our strategic goal of environmental protection in our country is preliminarily fixed as follows: By the year 2000, the whole country's problems of environmental pollution and destruction of the ecology are to find their basic solutions. We shall strive energetically to have the production and living environment of the people in urban and rural areas reach a level of cleanliness and beauty, to have the natural ecology and environment return to a condition of excellence, basically attuned to the level of prosperity that will be reached in the material civilization that the people will be living in. Achieving this strategic goal will equally require that we have a set of directives which include quantitative norms. This is so because in order to realize the strategic goals of economic and social development and of environmental protection, there is the problem of computing and measuring the degree of improvement in economic benefits, social benefits and environmental recovery. In order to acquaint all trades and industries at all levels and the broad masses with the importance and the path of environmental protection, we must also use vivid examples and scientific evidence to persuade and convince. It is therefore an important task at this juncture to establish an economic, social and environmental norm system that is well perfected, is comprehensive and divided by categories, through penetrating investigations and study, wide-ranging collection of data and by engaging in scientific forecasting and analytic computations.

In all matters that are attempted, it is very important to have a strategic vision. Only with a strategic vision can one be realistic, determine a clear and definite struggle goal that is comprehensive and also divided by stages, select the most favorable path, propound what is right and avoid what is wrong, bring one's superiorities into full play and achieve the successful realization of one's objectives. At present, many countries and international organizations throughout the world engage in "developing forecasts" and in determining "developmental strategies," publishing such writings as "The Earth by the Year 2000," "Europe by the Year 2000," "The United States by the Year 2000," "Japan by the Year 2000," etc. Regardless of their various points of view, they are expressing their strategic visions. Having already set forth our strategic goal to be achieved by the end of this century, our country is now in the process of launching forecasts and studies for "China by the Year 2000," "The Chinese Economy by the Year 2000," "The Chinese Environment by the Year 2000," etc. These studies are undertaken under the guidance of the strategic goals for our country's development, the key strategic points and strategic measures determined by the 12th CPC National

Congress and after a comprehensive analysis and study of the subjective and objective conditions of China and of foreign countries. The purpose of these studies is to arrive at a fairly distinct and concrete picture of the Chinese economy, the social and environmental conditions by the year 2000, also to explore the best path for the achievement of the strategic goals in our economic, social and environmental developments, to forecast the policy decisions and the factors they are based on, also the policies that have to be decided upon and their consequences, also to set forth the demands that we must make on the present work in all quarters of the country and to determine the measures that have to be adopted. In these studies the expense-benefit analysis, input-output method, economical and environmental models and other such methods of economic mathematics are extremely important tools. Using these tools will involve certain "numbers," which means, it will be necessary to investigate the basic "numbers," use certain reference "numbers," calculate absolute and relative "numbers," simulate and forecast unknown "numbers." The use of these methods will allow us to clearly and definitely analyze all aspects of the economic and social developmental process, including that of environmental protection, and the relationship of quantitative interdependence arising between the various factors. Establishing economic, environmental, and other such mathematical models, translating the data from all quarters and of all factors into the mathematical language of computing techniques and using electronic computers to quickly compute the results will not only deepen, and render more accurate, our concepts of the inherent lawfulness in the various stages of development of the socialist modernization drive, but will also deepen, and render more accurate, our concepts of the quality aspects of their lawfulness, and therefore enable us to improve our work in the national economy, whatever it may be, including our environmental work. As the economic analyses are rendered more quantitative, as policy decisions in construction are rendered more scientific, as planning work is modernized, forecasting methods are becoming more widespread and managerial methods of computerization become more modernized, it is absolutely impossible to conscientiously study the solution of problems of economic and environmental theory and practice without a certain knowledge of mathematics and without the necessary quantitative analyses. It has obviously become an absolute necessity to study the new fields of knowledge and to make every effort to raise our level of mathematical knowledge as it relates to the study of the management and the actual work of environmental protection.

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ENVIRONMENTAL SYSTEMS ENGINEERING OUTLINED

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[Article by Qian Xuesen [6929 1331 2773]: "Engineering and Technology for Environmental Protection--Environmental Systems Engineering"]

[Excerpt] I.

First, I hold that the concept of man and biosphere is not sufficiently precise and cannot cover all ranges of modern man's activities. As Comrade Pu Hanxin [3184 3352 2500] has pointed out,[2] "the earth's surface layer" or "geographic crust," employed by Soviet scientists, are more precise. The earth's surface layer includes, upwardly, the troposphere (which extends up to 8 km over polar regions, 17 km over the equator or, on the average, 10 km above the earth) and, downwardly, the upper part of the lithosphere (extending to a depth of about 5-6 km below land surface and to about 4 km underneath sea bottoms). Only these regions are being exploited and utilized by man today and have great consequences. Therefore, the environment should be treated as the earth's surface layer and not as man and the biosphere.

As Comrade Pu Hanxin has pointed out, nonorganisms, organisms and man, which are included in the earth's surface layer, may be treated as a macrosystem, an open and orderly macrosystem. Such a system, according to Prigogine, a Nobel Prize winner, is a dissipative structure that is far removed from equilibrium; is alive and, not dead; and develops and evolves, and is not static or unchangeable. Why do we say such a system is open and not closed? Because the earth's surface layer exchanges material and energy with places outside of it. As to things which are received by the earth's surface layer, there are, for example, solar radiation, whose power is as great as 1.73×10^{17} watts; tidal energy, 3.5×10^{13} watts; hot magma emanating from deep within the earth's crust; various particle currents from space, such as cosmic rays, electromagnetic waves, meteorites, aerolites and so forth. On the other hand, the earth's surface layer also emits things, the greatest being infrared radiation, which is transmitted into space and is roughly equal to solar radiation. A few light gaseous molecules are scattered about in the upper atmosphere layer and even into space; at the edges of earth-crust plates, rock strata are thrust obliquely into deeper

earth layers; satellites and spaceships are sent into space; and so forth. Things received by the earth's surface layer are not equal to those it emits. This change is engendered within the earth's surface layer, which is therefore open.

Why do we say that the earth's surface layer is also orderly? First, it develops, or evolves, regularly. It has a history of several hundred million years--from a lifeless state when the earth was formed to the state of having organisms and from there to being inhabited by mankind with his high-level material civilization and culture. Pu Hanxin has already described this process,[2] so I will not repeat it here. What I want to point out is that the orderly nature of the earth's surface layer is manifested in the layer's multileveled structures, which is characteristic of orderly macrosystems.[3] What kind of levels? In terms of environmental protection, the first and most basic level includes a plant or an enterprise, a living area, a woodland, an agricultural field, a fishery water surface, etc. As to the last structures mentioned above, ecological community is a most important concept. Our biologists and agronomists have done much research in and gained very successful experience in applying this concept. Comrade Zhang Zhongliang [1728 1813 0081] of the Northwest Forestry College recently summarized this work.[4] As to the ecological community of a fishpond, the high yields in fresh water fish breeding achieved by Liang Ermei [2733 0059 1188], a member of the Seventh Production Team, Fengjian Brigade, Xingtan Commune, Shunde County, Guangdong Province, is amazing.[5] In 1982, she obtained 2,278 jin of fish per mu of water surface! This achievement is a result of learning.

The next level in the earth's surface layer is the environment of a region. Regional divisions cannot be coterminous with administrative units and are not to be found along lines of some city or some city-administered county. Rather, regions must accord with actual conditions and interactive relationships and are formed relatively independently. For example, the Chang Jiang delta is a region. And there are several scores of structures at this level in China.

The next level is that of the nation, and last, of course, is that of the world. Therefore, counting from the basic unit, there are four structural levels in the earth's surface layer. When distinguishing levels, we must treat man's activities as primary and natural conditions as supplementary, because man dominates the earth's surface layer and is the most active factor therein. This also illustrates how important it is for us to understand internal relationships in the earth's surface layer and the laws of its [vague in original] movement and change. Lack of such understanding might lead to wrong tactics, doing stupid things and even reversing the development of the earth's surface layer from evolution to degeneration. In order to attract attention, I suggest calling this field the study of the earth's surface layer. This will be a new branch of learning combining geography, geology, meteorology, the productive technology of industry and agriculture, technological economics and national land economics. Because we are studying a macrosystem which has many levels and an orderly structure, we need the basic theory and assistance of systems science. We should establish the

study of the earth's surface layer in order to gain a profound understanding of the laws of movement in macrosystems and to discover the theoretical bases for the improvement and evolution of the environment.

II

By now it should be clear that I wish to discuss the macrosystem of the earth's surface layer and have proposed establishing the study of the earth's surface layer because all changes in the earth's surface layer affect our environment. In order to do well in environmental protection, we must study the environment carefully and set up the necessary theoretical foundation. As the earth's surface layer has been affirmed as a macrosystem, the technology to govern this macrosystem should be affirmed as a form of systems engineering, environmental systems engineering. Therefore, the study of the earth's surface layer provides the theory for environmental systems engineering, and the latter is an engineering technology which applies the study of the earth's surface layer to protect and improve our environment.

Since the protection and improvement of the environment is a form of systems engineering, then environmental systems engineering also depends on the general methods and theories of systems engineering, such as operations research, computer technology, control theory and so forth. Environmental systems engineering has to use the achievements of national land economics as well.

Below I would like to outline my views regarding environmental systems engineering:

In line with the conception of the earth's surface layer as a macrosystem, solutions also must be defined by scale within environmental systems engineering. The first scale corresponds to the first level of the macrosystem of the earth's surface layer and includes basic-level units of industrial and agricultural production and people's livelihood. The second scale corresponds to the second, or regional, level; the third scale, to the third, or national, level; and the fourth scale, to the fourth, or global level. Tasks of each scale within systems engineering are not all the same, and the governing principles differ correspondingly.

In terms of national administration, the first level of environmental systems engineering consists primarily of formulating laws and regulations, requiring that all basic units strictly comply with these laws and regulations and ensuring that the environment is not polluted. This level also includes test sampling and monitoring work, the standards of which naturally should be appropriate and steadily increased as technology improves. For this, we need to apply the scientific method of cost-benefit analysis, by which we can compare the economic results of various monitoring standards and weigh the advantages and the disadvantages of each. On the other hand, we should do promotional work to heighten people's recognition of the importance of environmental protection. We have not done enough in this area. For example, in utilizing wastewater, waste gas and waste residue, we have always emphasized prevention of harm and disaster and never the

positive elements. Wastes are actually man-made resources, and they are right in our hands and do not require mining and transporting! It must be pointed out that wastes can be utilized not only in industry, as noted above, but also in agriculture, where we must work hard to develop this practice. Work at this level in environmental systems engineering is fundamental, and only if the foundation is steady can the work of higher levels be conducted, as in the issue of acid rain.[6] Full utilization of wastes and turning wastes into benefit should be one of the ways to demonstrate the superiority of the socialist system. Comrade Xu Dixin [6079 3321 2450], an economist, has explained this issue well.[7]

Regions are regarded as the second level in environmental systems engineering. At this level, the first priority in environmental improvement work is afforestation, making regions green and growing flowers and grass. China is now paying great attention to this work and has called on everyone to make the entire country green. I think that environmental work should also include restoring areas of the earth's surface destroyed by strip mining and transforming and revitalizing areas where slag piles have been created. This is already considered a form of pollution in countries where industrialization developed early. For example, this kind of man-made wasteland is increased by 500 square km in the United States every year, where the total reaches 15,000 square km. We should pay attention to this problem from now on, avoid this kind of destruction from the outside and restore such areas wherever they appear. Climate control is a much more active form of environmental systems engineering work. For instance, along China's southeastern coast, we are trying to change the direction of typhoons, to prevent such storms from landing and to realize their advantageous rainfall while avoiding the damage they bring. Going further, it is possible to induce artificial rainfall. This meteorological technology originally started in the 1950s but later declined in capitalist countries, and nobody even tries anymore because the rainfall areas are hard to control with precision. One country might invest in the technology, but the rain will usually fall on and benefit somebody else. This problem is easy for a socialist country such as ours to settle.

The next level in environmental systems engineering is the national or interregional level. Measures of this kind include the forest belts being planted in northern China in order to guard against desert encroachment and the eastern lines begun this year, of the south-north water diversion project.

Following progress in socialist construction, this level of measures will grow in number as our national strength increases. Nevertheless, the national level must also consider the problems in other areas, which if properly resolved, would benefit environmental protection and improvement work at lower levels. For example, the national policy on energy requires the transformation of fuel coal in order to avoid troubles caused by coal burning, vigorous development of methane in order to solve the energy problem in the countryside and the problem of sewage treatment in cities and full utilization of such clean energy as water power, and wind energy, etc. All these areas will create conditions for the first and the second levels

of environmental systems engineering. Actually, architectural forms also affect the environment; buildings which are warm in winter and cool in summer can help to protect the environment and to reduce pollution. It is reasonable for Comrade Ren Zhenying [0117 7201 5391], vice president of the Architectural Society of China and deputy mayor of Lanzhou, to recommend cave dwellings on loess plateau.[8] Are underground buildings not recommended abroad? Cave dwellings are similar to underground buildings, and with the application of modern technology, we can transform caves into modern housing and work places. Related to environmental protection, the state now must study the problems of nuclear waste disposal. All countries throughout the world have failed to find a proper resolution of this problem. Nuclear energy must be greatly developed, and we must study this problem immediately and put forward an overall plan.

The last level of environmental systems engineering is related to global environmental protection and improvement, especially to long-term, future environmental evolution. Is that evolution going to be bad or good? Is the concentration of carbon dioxide in the atmosphere really steadily increasing? Does there really exist a so-called greenhouse effect which makes the atmospheric temperature go up? Global environmental systems engineering is an internationally coordinated project. Yet is seems that the Man and Biosphere Committee of UNESCO has not made any major achievements in this area, because resolving international problems is much more difficult than preaching.

The four levels of environmental systems engineering described above form an integral whole, because the environment is nothing but the unified macrosystem of the earth's surface layer. Thus, these four levels are interrelated. This is a feature of environmental systems engineering. Of course, my discussion is not necessarily complete, and I may have omitted something. For example, very important things like weather forecasting and earthquake prediction were not included in environmental systems engineering, yet weather and earthquakes are important factors affecting the environment.

III

Above, I described the entire environmental problem, as I understand it: theory, the study of the earth's surface layer, engineering technology and environmental systems engineering. It can be seen that this issue is truly complicated and colossal, and the Ministry of Urban and Rural Construction and Environmental Protection set up by the State Council is a very good thing. But this is just the beginning. For our descendants, for socialism and for a communist tomorrow, much work remains to be done! We must seriously study the environmental issue and establish necessary research organs. In addition, since this is a new undertaking and involves pathbreaking work, we must earnestly consider the problem of training new personnel. I heard that some research units have enrolled graduate students and trained professionals. This is what should be done.

It seems that all of this work requires an overall plan. We must be farsighted. We must see into the 21st century!

FOOTNOTES

1. [Omitted]

2. Pu Hanxin, in ZIRAN ZAZHI [NATURE] No 2, 1983, p 126.

3. Qian Xuesen, in XITONG GONGCHENG LILUN YU SHIJIAN [SYSTEMS ENGINEERING--THEORY AND PRACTICE], No 4, 1983.

4. Zhang Liangcheng, in ZIRAN ZAZHI, No 3, 1983, p 163.

5. JINGJI CANKAO [ECONOMIC REFERENCE], 17 March 1983, p 1.

6. HUANJING GUANLI TONGXUN [BULLETIN ON ENVIRONMENTAL MANAGEMENT], No 1, 1983, p 3.

7. Xu Dixin, in RENMIN RIBAO, 18 February 1983, p 5.

8. Ren Zhenying, in BAIKE ZHISHI [ENCYCLOPEDIC KNOWLEDGE], No 2, 1983, p 20.

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ARTICLE VIEWS 'SAFE, ECONOMICAL' NUCLEAR ENERGY

HK221515 Beijing RENMIN RIBAO in Chinese 16 Mar 84 p 3

[Article by Qu Geping: "Nuclear Power--Safe and Economical Energy"]

[Text] Vigorously developing nuclear energy is an inevitable trend in the development of energy resources in the world. Now, nuclear energy has already become an important energy, ranking next only to coal, petroleum, natural gas and hydropower.

By the end of 1983, there were already 302 nuclear power stations in operation and their power totaled 198.5 million kilowatt-hours, which constituted 10 percent of the total electric power output in the world. In France, Sweden and Finland, nuclear power constitutes more than 30 percent of their power output. Not only industrially developed countries pay attention to developing nuclear power industry, many developing countries are also vigorously developing it. Nuclear power stations are operating in some Asian countries and regions including Pakistan, India, South Korea and our country's Taiwan Province. It is expected that by 1985, the output of nuclear power will account for more than 17 percent of the total power output in the world and this percentage will rise to 26-35 percent by the end of this century. This shows that the development of the nuclear power industry is in the ascendant.

How can nuclear industry develop so quickly? This is because the development of the nuclear power industry is an effective measure to ease the energy crisis that faces the world. As the population grows sharply and economy develops quickly, the demand for energy will become increasingly great. In 1978, the total demand for energy in the world was 260q (1 q equals 36 million tons of standard coal), but by the year 2000, it will reach 560q. There are but limited resources of organic fuel in the world. The known petroleum deposits in the world can only last a few decades at the present level of consumption, therefore, the shortage of organic fuel will become increasingly outstanding. However, there are rich deposits of nuclear energy. The known deposits of uranium are equal to 1,850-2,560 billion tons of coal in terms of energy. This represents a huge energy resource that the human race has mastered. Therefore, the development of nuclear energy is an important way to solve the shortage of energy for the human race.

Another reason why the nuclear power industry is able to develop rapidly is because it is relatively economical. The nuclear fission of 1 kilogram of

uranium-235 produces an amount of heat equal to that of 2,500-2,700 tons of standard coal. A 1 million kilowatt nuclear power station consumes 30 tons of nuclear fuel every year and needs only a small volume of transportation while a coal power station of the same scale consumes 2.12 million tons of standard coal every year, the transportation of which would require 1 ship of 10,000 tons displacement or 3 trains of 40 cars each to be in full operation throughout the year. Foreign practices have proved that the capital construction expenditure in a nuclear power station is higher than an ordinary thermal power station, but its expenditure in fuel is much lower than the latter. Therefore, the per unit cost of electricity of a nuclear power station is only 15-50 percent of that of an ordinary thermal power station. As the management standard and technology continue to develop, the economic advantage of the nuclear power industry will become increasingly clear.

It is imperative for our country to develop nuclear power industry. The shortage of energy at present has already hindered the development of our national economy. From a long-term point of view, the realization of the goal to quadruple our gross annual industrial and agricultural output value is to a very great extent determined by the supply of energy.

Our country has abundant energy resources, but the per capita energy resources cannot be regarded as abundant because of the large population. Moreover, because of the restriction of the geographic location of energy resources, the shortage of energy will be difficult to overcome for a relatively long period to come. Sixty percent of China's coal resources are in North China and 70 percent of the water conservation resources are in South China. However, most of its industry and population are concentrated in Huadong, Huanan and Dongbei. The industrial output value of these areas accounts for 70 percent of that of the nation, while its energy resources account for only about 10 percent of that of the nation. Solving the problem related to the shortage of energy supply in these areas is an important link in speeding up the development of our country's national economy.

Vigorously mining coal and transporting it from north to south is an important measure. However, because of our limited transportation facilities, it is difficult to mine a large amount of coal. Vigorously developing the hydroelectric power industry, particularly exploiting the waterpower resources in the Chang Jiang, and transmitting electricity from west to east is a positive measure of strategic significance. The state is planning to do this. However, it is difficult to carry out too many development projects in these areas. Therefore, while vigorously developing thermal and hydroelectric power, we must vigorously develop nuclear power industry. The relevant departments of the state are formulating a plan for the development of nuclear power industry. In the period from now to the year 2000, our country will establish a number of nuclear power stations. As these nuclear power stations are established and put into operation one by one, we will ease the shortage of energy in our coastal areas and this will certainly vigorously promote the development of our national economy.

There are many favorable conditions for the development of nuclear power industry in our country. 1) Our country is one of the small number of countries

that have mastered nuclear technology. It has mastered all the technology related to the operation cycle of nuclear fuel including mining, extracting, enriching, manufacturing of components, consuming fuel in reactors, after-treatment and storing of waste. It has gained experience in operating nuclear reactors and is capable of designing and building nuclear power stations. 2) Our country is relatively abundant in nuclear fuel resources. 3) Because of our country's vast territory, we have sufficient leeway in selecting the locations of nuclear power stations and can find appropriate locations for them even in densely populated areas and thus achieve a rational layout.

The economic rationality of nuclear power stations can easily be understood by the people, but there is often much worry among them about its safety. This is a question that we must answer. Judging by the practice in operating nuclear power stations in the past 30 years, nuclear power is a safe and clean energy. The design and construction of a nuclear power station is of a higher standard than that of ordinary industry and the management measures in nuclear power stations are much more strict. The record of safe operation of nuclear power stations on the environment is also much smaller. The residents in the vicinity of nuclear power stations abroad receive an annual radiation dosage from them that is only a few percent of the natural background radiation dosage and is also lower than that which a person receives from daily watching color television. This dosage is much lower than the prescribed standard. The nuclear power station that we plan to build in Guangdong will be of international advanced standard. The annual radiation dosage received by the residents in the vicinity of this power station will only be about one millirem, 2 percent below the state's prescribed standard. It is equal to only 1 percent of the natural background dosage and has a negligible impact on and harm to the ecological environment and people's health. The practice in the past 30 years of operation in the nuclear stations abroad shows that as yet, no one has ever been hurt or killed by radioactive materials. This low accident rate is rare in other industrial sectors.

Compared with power stations using coal, nuclear power stations are much less harmful in causing environmental pollution. According to the analysis data abroad, the rare gas and radioactive materials released by a nuclear power station only gives the nearby residents a radiation dosage of less than 2 millirem a year, while the radioactive elements released by a 1 million kilowatt power station using coal gives the nearby residents a radiation dosage of about 5 millirem a year, almost 300 percent more than that given by a nuclear power station.

Soviet data shows that a thermal power station is 30 times as carcinogenic to nearby residents as a nuclear power station. An American analysis report says that the radiation of nuclear power industry causes a carcinogenic hazard that is only a 10-millionth of that caused by other factors in the society.

Why are people doubtful about, and apprehensive of nuclear power stations, since these power stations are both clean and safe? There is a historical reason for this. Atomic energy was used for military purposes. People's memory of the disaster in Hiroshima caused by an atomic bomb is still fresh. Naturally, in their minds they will link nuclear power stations with atomic bombs.

In fact, the reactor in a nuclear power station is entirely different from an atomic bomb in structure and characteristics. In an atomic bomb, enriched uranium of nearly 100 percent density is used while in a nuclear power station low-density uranium of 2-4 percent density is used. Under any circumstances, it is impossible for the uranium used in a nuclear power station to reach the density that will cause a nuclear explosion. In a reactor there are perfect safety control facilities which enable the fuel to release its energy slowly and which is characterized by an automatic stabilization function, namely, when the nuclear energy is released unexpectedly quickly and causes an extensive rise in the temperature of the core, the chain fission will automatically weaken and even stop, thus avoiding a nuclear explosion. As for the transportation, storage, and aftertreatment of nuclear fuel, the many years of experience both at home and abroad prove that there is a way to guarantee safety.

In Western countries, some people have raised the banner of environmental protection to oppose the construction of nuclear power stations. Their exaggerated propaganda greatly distorts the image of nuclear power stations. Ironically, in spite of the loud protest, nuclear power stations develop steadily and continuously. Both their numbers and scale have increased and their locations are moving from remote areas to the areas near the densely populated and economically-concentrated cities. This has proven with facts the cleanness and safety of nuclear power stations.

What attitude should the environmental protection workers in our country adopt toward nuclear stations? I should like to sum up this attitude as follows: They should vigorously support and enforce strict requirements for nuclear power stations. The construction of nuclear power stations is an important measure to speed up the development of our national economy, therefore, we must support the development of our nuclear power industry in just the same manner as we do all other undertakings that facilitate our economic development. Compared with power stations using coal, developing nuclear power stations is more favorable for environmental protection. At the same time, they should enforce strict requirements on the construction of our nuclear power stations. This is because while giving out huge amounts of energy, a nuclear fission produces extremely radioactive materials. Therefore we must adopt really effective and strict preventive measures. It is conditional that we say that a nuclear station is clean and safe. This condition is that we adopt effective safety measures in every link of its operation to ensure safety.

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ENVIRONMENTAL RESEARCH MUST TAKE MULTI-DISCIPLINARY APPROACH

Beijing GUANGMING RIBAO in Chinese 10 Jan 84 p 2

[Article by Lin Yushu [2651 3768 2885] and Lin Fengsheng [2651 7685 3932]: Lu Jiaxi Stresses Multi-disciplinary Approach in Environmental Research]

[Text] Addressing the Second National Conference on Environmental Protection which closed on 7 January, Lu Jiaxi, President of the Chinese Academy of Sciences, said that in the important task of environmental science research, it is imperative that research be comprehensive, and that various disciplines and units cooperate. He suggested that the State Scientific and Technological Commission set up a national institute for environmental research to coordinate research in environmental science.

Lu Jiaxi pointed out that environmental science and technology are the basis and means of understanding and solving environmental problems. They cover a wide area and involve very complex issues, with many principles yet to be understood and a vast terrain yet to be explored. To judge by the environmental science research projects the Academy has undertaken and participated in, it is very difficult for one single discipline or unit to achieve the mission of environmental protection. Instead, it depends on a variety of disciplines and units interacting, cooperating, and vigorously setting up a scientific research contingent. This inter-dependency is amply borne out by the significant research projects which we have accomplished through cooperation with our fraternal units such as the assessment of environmental quality in the western suburbs of Beijing, protecting the water sources of the Guangting Reservoir, oil pollution along the coasts of the Bo Hai and Yellow Sea, controlling pollution and biological purification of pesticides in Ya'er Hu, combating mercury contamination in the Ji Canal, and environmental research in the Beijing-Tianjin-Bohai region.

Lu Jiaxi said: the environmental and ecological problems which have practical significance and are related to the development of energy resources are another example where comprehensive research is needed. In our drive to quadruple the national output value, we depend on coal as our main source of energy, particularly high-sulfur coal. In burning large quantities of coal, we inevitably release large amounts of sulphur oxide, carbon oxide and nitrogen oxide into the environment, producing qualitative changes in the atmosphere. This is how the world-wide problem of acid rain came about and it has appeared in China. Research on acid rain requires a multi-disciplinary

approach. The study of acid rain formation involves research on the chemistry of atmospheric pollution, interface chemistry, and reaction on dynamics; the transfer and transportation of acid rain requires research on atmospheric physics and meteorology. All this makes up only part of the basic research on acid rain. Numerous other research topics have to do with the effect of acid rain on the environment and ecosystem. Acid rain directly and indirectly retards the growth of forests, causes acidification of soil, lakes and rivers, affects the growth of terrestrial and acquatic life, hastens the decay of buildings and historic landmarks, and brings about metallic corrosion in electric cables and piping. In addition, the fight against acid rain depends on the participation of personnel in such fields as geography, biology, chemistry and medicine.

Lu Jiaxi put forward two proposals to protect and improve our environment as soon as possible.

1. A national institute of environmental research should be set up under the State Scientific and Technological Commission. Its central leading group, made up of representatives from various relevant departments, will oversee offices set up to manage day-to-day affairs. As workers will be assigned to the institute by the various departments, there will be no increase in staff. The affiliation of the research units of the departments which take part in the institute will remain unchanged. It will be the responsibility of the national institute of environmental research to draw up, amend, and implement the key points of a national plan to develop science and technology for environmental protection; determine, coordinate, and supervise key research projects, and assess research results; distribute and manage the funds for environmental scientific and technological research; and organize the training and circulation of scientific workers, and international academic exchanges.

2. The division of labor among the various scientific research units involved should be better demarcated to ensure coordination and interaction in order to further improve our overall capability.

China's environmental protection units at the national level emphasize nation-wide and regional environmental protection policies, standards and regulations, and conduct research on environmental quality and monitoring. Institutes at the local level deal with problems in the localities. The Chinese Academy of Sciences emphasizes research on the basic theories of the environment and the ecology, and the research on new technology. The Chinese Academy of Social Sciences stresses research on population and the environment, resources and the environment, environmental economics and environmental law. Colleges and universities are concerned with research on application, engineering, the developing of new technology, and the training of experts. Industrial departments (bureaus) emphasize comprehensive utilization and pollution control in their own special fields.

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ADVANCES, PROPOSALS FOR FURTHER RESEARCH IN ENVIRONMENTAL BIOLOGY

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese
No 6, 21 Dec 83 pp 34-35

[Article by Wang Deming [3769 1795 6900]: Advances in Environmental Biology and Some Suggestions]

[Text] I. ADVANCES IN ENVIRONMENTAL BIOLOGY

Environmental biology research began in China more than fifty years ago, but it was not until 1975-1978 that the term 'environmental biology' was formally established. Over the last ten years, environmental biology has flourished in China. Its progress can be summed up as follows:

1. There has been extensive research on the effects of pollution on living organisms, from the lower to the higher orders, from terrestrial to aquatic life, and from animals to plants.

2. Useful indicators and indicator organisms discovered can be applied to the biological monitoring and evaluation of water pollution.

3. Biological control has been playing a useful role in the treatment of polluted waters.

4. Progress has been made in studies on atmospheric pollution and the utilization and mechanism of plants.

5. Much work has been done on farmland environmental protection.

6. Life sciences research has made encouraging progress.

7. People are beginning to pay attention to nature protection.

I. PROPOSALS TO EMPHASIZE RESEARCH ON NATURE PROTECTION AND RURAL ECOLOGY

In the following, I offer my views on the research of nature protection and the rural ecology.

At present, the destruction of China's natural resources is serious. Both wildlife and plant resources have suffered extensively from indiscriminate hunting,

slaughter and felling. A number of rare forms of life have already become extinct or are on the verge of doing so. Some well-known forests are seriously decimated, with quite a few unique species perilously close to disappearance. In some cases, however, nature preserves have been set up in time to salvage tens of thousands of mu of redwood forests once threatened by man's desire to clear land for agriculture. Nature preserves are essential to the protection, restoration, development and rational utilization of natural resources, to historic preservation, to the improvement of the human environment, and to the promotion of the economy, culture, education and sanitation. At present, however, there is a serious disparity between the quality and quantity of China's nature preserves and natural conditions. China's nature preserves are fairly small. They are all of the same kind and are unevenly distributed. No integrated organization exists to manage them. To a greater or lesser extent, many nature preserves have been damaged. Research in this area must be strengthened.

Agricultural production in many places in China is predatory. The only concern is short-term production gains, not long-term consequences. Farmland has become increasingly infertile. Agricultural production is organized irrationally, with imbalances among farming, forestry, sideline operations, animal husbandry and fishery. To make things worse, millions of commune and brigade-run enterprises have sprung up across the country in recent years. They operate on a small scale and develop quickly. But their meager resources also make them serious polluters and since they are widely distributed, pollution control is very difficult. A small factory can often pollute an entire stream or a small town. Even worse are the damaging agricultural practices that violate ecological laws. Such as: to produce food, forests are destroyed and land cleared, or dykes are built to reclaim land from a lake. Much land has been levelled and many trees felled to create flatlands. Pesticides and chemical fertilizers have been used indiscriminately. China uses several hundred thousand tons of pesticides each year. Yet the utilization ratio is only about 10 percent, the rest being spilled onto soil, water, crops or released into the atmosphere.

Some pesticides make their way into the human body through the food chain and therefore become a hazard. With a utilization ratio of only about 30 percent, chemical fertilizers are largely lost to soil and water. They are the chief source of pollutants in drinking water, such as ammonium nitrate and nitrate. Another major problem is the estimated several hundred million tons of biological energy burned by villages across the nation every year. Not only is the rural environment polluted, but the destruction of vegetation resulting from deforestation also intensifies soil erosion and has a negative impact on climate. Moreover, the inability of a large quantity of plant stalks to return to the soil reduces the organic matter in farmlands, and leads to soil hardening and declining fertility. All this devastates the agricultural ecology and the nature environment. We must combine economics with ecology and develop and utilize natural resources rationally so that agriculture can achieve coordination and all-round growth within itself and in conjunction with other industrial and commercial sectors. Instead of finding their way into the city, organic wastes can be recycled, re-utilized, and finally returned to the soil, thus providing a rich energy source and a highly effective organic fertilizer for agricultural production. In this way, a vicious cycle is

transformed into a positive one, reversing the imbalance in the ecology into an equilibrium that can increase production, improve quality, lower consumption and beautify the environment.

The guiding ideology for scientific research in this area is: Combine ecological principles with economic principles and develop, utilize, and manage natural resources in a way that suits local conditions. The utilization ratio of biological energy and organic fertilizers must be improved and the recycling of wastes increased. Thus, agriculture, forestry, sideline production, animal husbandry and fishery will be able to achieve coordination with certain industrial and commercial activities and develop comprehensively, and protect the ecological balance between nature and social development.

III. ISSUES TO BE EMPHASIZED

1. We must encourage research to solve the rural energy shortage and strengthen the recycling and utilization of biological energy.

2. Pesticides which are highly effective and have low residues must be popularized, while those with high residues restricted or banned. We must support research on biological control and its applications.

3. Prevent pollution from spreading to rural areas and develop non-polluting industries.

4. To aid research and protect the natural environment, nature preserves for a variety of ecological systems must be set up in a planned way.

5. We must ensure the survival of rare species or those on the verge of extinction through systematic artificial propagation and breeding.

6. Without affecting their ability to reproduce, we must control the number of species so that the species and the ecological system can be sustained, and natural habitats and resources used rationally.

7. When carrying out large-scale construction projects, the state should conduct an integrated evaluation of the resources and species in the affected areas, issue an environmental impact statement and put forward control measures.

IV. SOME PROPOSED RESEARCH IDEAS

We might consider whether or not the following ideas are feasible:

1. Select a number of preserves across the country where the pattern of life in an undisturbed environment can be observed. Such observations can provide a basis for the transformation or planning of new ecological systems.

2. Select a number of rare forms of life on the verge of extinction for artificial preservation, breeding and cultivation. Preserves must be set aside for rare and endangered animal or plant resources.

3. Develop research on the rural ecological system; increase the energy flow and material exchange of the ecological system; make full use of natural resources to stabilize and develop production in a steady, consistent way; and protect the environment and regional ecological balance.

V. PROPOSALS FOR FUTURE DEVELOPMENT OF ENVIRONMENTAL BIOLOGY

We should emphasize research on the impact of pollution on the structure of various ecological systems. Set up simulated biological models of ecological systems (including micro-global system and controlled ecological systems) and simulated mathematical models. Forecast the effects of pollution on the stability, community structure, dynamics, material circulation and energy exchange of ecological systems. We should study the regulation control, and balance within a variety of ecological systems (including mines, fields, forests, grasslands, and marine environments) and their interactions with one another. Study the regional and global impacts of pollution on the biosphere and biological resources. Intensify theoretical and applied studies on biological purification. Intensify research on the poisoning mechanism induced in living organisms (including man) by toxic substances; as well as the carcinogenic changes, malformations and mutations caused by changes in the environment.

12581
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ENVIRONMENTAL EDUCATION IN CHINA SURVEYED

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCE] in Chinese No 2, 30 Apr 83 pp 73-75

[Article by Environmental Science Research Institute, Beijing Normal College: "A Survey of Environmental Education in China"]

[Text] Environmental education in China has developed in response to the development of environmental protection. Its objective is to impart an understanding of the content and complexity of the environment, the union of the two opposites of man and environment and the importance of protecting the environment, and to establish a correct attitude toward the environment. In persons involved in environmental protection, it stimulates awareness and activisim regarding protection of the environment and improvement of environmental quality as well as helping them master the knowledge, techniques and capabilities of environmental protection and improvement. Therefore, environmental education is a strategic task of profound and far-reaching significance in China's modernization.

Environmental education must be suited to the developmental needs of the national economy and of environmental protection, must be included in all national education plans, and must be treated as a component of the educational plans; a distinctive environmental education system must gradually be formed.

1. Instruction in Schools

Instruction in schools can be divided into general education and advanced education. In general education, environmental knowledge must be imparted from kindergarten and elementary school to middle school. Its objectives are as follows. In kindergarten it fosters a correct attitude toward environmental protection and good hygienic habits. In elementary school it trains the students to understand the environment and maintain good environmental capabilities. In middle school it increases the student's environmental knowledge and concepts and his attitude toward the environment and intensifies training in environmental improvement techniques. Advanced schools and intermediate specialized schools dealing with science, engineering, agriculture and forestry, medicine, economics and law should all establish survey courses in environmental protection so as to give the students general knowledge of environmental science. Some advanced schools should establish environmental

protection specialties and admit graduate students and systematically train environmental protection specialists.

Spot experiments in environmental education in middle school, elementary school and kindergarten have been conducted in accordance with the suggestions of the First Congress of the Environmental Education Committee of the China Environmental Science Society (30 November to 2 December 1979). The kindergarten associated with Beijing Normal Academy, the experimental elementary school of Beijing Normal College, Guangdong middle school No 42, 11 key middle schools in Beijing and other middle schools in other cities and provinces have had excellent results in these experiments. The key problem at present is to further summarize experience, expand and disseminate it, and solve problems related to the training of teachers and provision of instructional materials.

The Environmental Science Research group of the Department of Geography and the Preschool Research and Teaching Laboratory of the Department of Education, Northwest Normal College, created a kindergarten environmental education experimental group in February 1980, which conducted experimental teaching in four kindergartens, including the academy's associated kindergartens and the Lanzhou Military District kindergartens. It wrote a general kindergarten environmental education plan, and carried out instruction using such methods as observation, experiment, talks, storytelling, picture explanations, and electrical teaching aids (slides, videotapes, film strips and the like). On 20 June 1980, Gansu Province Environmental Sciences Society held the Gansu Province Kindergarten Environmental Education On-the-Spot Demonstration Conference to spread the experience through the province.

The principal experience of Qinghua University's associated middle school and Guangzhou's No 42 middle school was as follows. a. They combined such subjects as biology, geology, chemistry and physiology and hygiene to teach environmental knowledge. b. The established extracurricular activity groups which conducted surveys and brief field investigations to develop the students' interest in and love of environmental science. c. It held exhibitions, reports, seminars, and educational film showings on environmental subjects in order to popularize environmental knowledge.

In advanced schools, our incomplete statistics on 32 physics and engineering science colleges subordinate to the Ministry of Education, key national universities and colleges and some local ones indicate that not only are environmental courses given in certain traditional fields and specialties such as plant and animal ecology, natural geography, analytical chemistry, environmental protection, water and soil protection, forest protection, water supply engineering, marine biology, and marine fishery resources, but some 30 advanced schools nationwide have established 20-odd specialties or special groups on environmental protection, primarily environment, environmental engineering, environmental medicine, environmental biology, animal life, environmental monitoring, environmental chemistry, pollution protection, construction and the environment, agricultural construction and environmental engineering, environmental protection in chemical engineering, wastewater treatment in chemical engineering, environmental protection in light industry, environmental

protection in the textile industry, and environmental engineering in the machine-building industry. More than 2,000 students are enrolled in these courses. The main problems at present are a lack of balance in the courses in the specialty, science courses inferior to engineering courses, and fewer comprehensive than general courses of study. Some topics such as environmental protection, management and economics and environmental law are still largely lacking. Teachers and educational materials are the key to effective environmental education. Training teachers and development of materials are proceeding in planned fashion. Some 95 teaching materials were displayed during experience exchange at the second congress of the Environmental Education Society (30 November to 5 December 1981 in Qinhuangdao, Hebei).

Since admission to graduate students was resumed in 1978, the first contingent of environmental science graduates has already graduated and begun work in environmental protection research and management. Starting in 1982, many advanced schools and scientific units began training M.A. candidates.

There are now two intermediate specialized schools in environmental protection: the Hunan Environmental Protection School, Changsha (founded in February 1979) and the Guangdong Environmental Protection School in Guangzhou (founded in September 1978), with nearly 500 students.

II. Employee Education

Environmental protection has existed in China only in the last 10 years, but it has developed rapidly in the last few years. Large numbers of cadres on the environmental protection front have come from other fronts; many have not had any specialized environmental education and cannot meet the development needs of environmental protection work. Thus there has been an urgent need to give them specialized courses. Various approaches and methods have been used, in accordance with local conditions and personnel capabilities, to provide extensive opportunities for study and enable cadres to learn job-related techniques while already employed based on the principle of "learn what you are doing and fill in gaps in knowledge," in order to improve job skills.

One of the main forms of employee education is short courses which personnel are given brief leave for short-term study in order to provide the basis for future independent study. The former Environmental Protection Leadership Group Office of the State Council in Dalian and the China Environmental Science Society jointly held the first training course for management personnel in September 1979; by the end of 1981 they had held 8 such courses and trained 1,224 personnel. Training was given to environmental protection management cadres from the various provinces and autonomous regions, the various State Council ministries and the PLA. Currently, an environmental protection cadre school is being established at Qinhuangdao, Hebei for environmental protection in urban and rural development, to serve as a basis for future cadre training. In addition to short courses for management cadres, between April and June 1980 the State Council Environmental Affairs Committee entrusted Zhongshan University and Nanjing University with holding three specialized short courses in atmospheric quality evaluation in which 294 technical

cadres were trained. According to statistics from 21 provinces and autonomous regions, 11 State Council ministries and the PLA, some 270 short courses were held for management personnel training about 13,000 persons, and 375 specialized short courses of various types have been held (including water quality analysis, atmospheric monitoring, urban noise monitoring, wastewater management, industrial boiler coke and ash prevention, environmental quality evaluation, environmental statistics and the like) in which 18,120 persons have been trained.

In addition to short courses for employees, longer short courses and spare time refresher courses not involving leave are also held. The Environmental Sciences Research Institute of Beijing Normal College held a 2-year refresher course in environmental quality evaluation for the environmental protection system, which was attended by employees with a college education. Nanjing Engineering Academy held a 2-year environmental protection study group in environmental protection for the Nanjing Environmental Protection Department, and Wuhan University's Environmental Law Research Institute invited foreign specialists to teach in a 1-year environmental law research group which it held in 1982. In October 1979, the Shanghai Environmental Protection Office and Shanghai Environmental Protection Society jointly conducted a study group in environmental engineering and chemistry and invited faculty from the Shanghai Railroad Institute as the main instructors; they invited 50 students from relevant prefecture and county offices to attend 2½ days a week without leave from work.

The employee refresher courses have been universally well received by cadres; they reflect the wishes and requirements of the great mass of cadres and are an important means of educating them and training them in a specialty.

III. Social Education

Protecting and improving the environment not only requires specialists in environmental protection, but also makes it necessary that technical and management personnel in all fields and the masses all understand the importance and necessity of environmental protection work.

In social education on environmental protection, the first propaganda month with environmental science as its main theme was held in March 1980 in implementation of the PRC Environmental Protection Law (Provisional Implementation), while in March-April 1981 propaganda activities were held nationwide in implementation of the State Council's "Decision on Strengthening Environmental Protection Work During Readjustment of the National Economy." In these two propaganda activities the environmental protection departments, propaganda departments, news and publishing organizations, scientific and research organizations and mass academic groups coordinated closely and made extensive use of newspapers, magazines, broadcasting, television, movies, slides, picures, exhibitions, report meetings, specialized seminars and other forms of propaganda. For example, in its "propaganda month" activities, Shanghai held more than 3,400 report meetings and specialized conferences, in which 890,000 persons participated.

The results of the propaganda and education effort were outstanding, and the masses have become increasingly concerned with environmental protection. The resident block committees in many cities have established environmental protection oversight groups or environmental supervisors, who have effectively promoted pollution control efforts in the local enterprises. The National People's Congress standing committees and executive committees in various areas have organized inspection and survey groups to survey the environmental pollution situation and have submitted many suggestions for strengthening environmental management work.

China has also published scientific popularization books and periodicals on environmental protection, such as the "Huanjing Baohu Kepu Congshu" [Popular Encyclopedia of Environmental Protection] published by Kexue Publishers and "Chengshi Luhua yu Huanjing Baohu" [Urban Greening and Environmental Protection] published by Zhongguo Jianzhu Publishers. Popular science magazines currently include HUANJING BAOHU (Beijing, established 1974) and HUANJING [Guangzhou, established 1978). These publications can be used to improve employee knowledge on the environmental front and also are effective tools for social education.

8480
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REGULATIONS URGED TO CURB NOISE POLLUTION

Beijing GUANGMING RIBAO in Chinese 21 Jan 84 p 2

[Article by Guo Xiulan [6753 4423 5695] and Sun Jimin [1327 0679 3046]: Environmental Noise Standards Should Be Quickly Established and Promulgated]

[Text] In recent years, noise pollution in China has become so severe that the urban population has been pressing for its strict control.

In 1982, China promulgated the "Environmental Noise Standards in Urban Areas" and before this had issued other standards. However, traffic noise in the nation's 25 large and medium-sized cities, including Beijing, Shanghai and Tianjin, all exceeded national standards, reaching a noise level of 82 decibels, 10 decibels higher than that in similar foreign cities. In some urban areas, the air harbor is so close to the cities that the noise level under the major flight path is as high as 92 decibels, making it difficult for offices in the area to work or for schools to conduct classes. In some old cities, the cheek-by-jowl arrangement of plants and residential areas makes factory noise pollution a serious problem. A survey in Beijing Municipality shows that 33.4 percent and 47 percent of the people were disturbed by noise in the daytime and at night, respectively. Noise pollution in recent years has caused numerous disputes between plants and people, and among the plants.

It should be stressed that the major reason why noise pollution has gotten so bad is the lax management of pollution sources. For example, narrow and crowded streets are a major cause of traffic noise. But an even more important reason is indiscriminate horn blowing by motorists and their failure to install mufflers, as required by law. In Beijing Municipality, which has the largest number of cars among the nation's large cities, the incidence of horn blowing has been reduced by 80 percent since 1982 when the municipality broadened the use of low-noise horns and implemented new measures to regulate street traffic. Despite an increase of 20 to 30 percent in traffic volume, noise level on major traffic arteries actually dropped 6 to 8 decibels. The reduction could be even more significant if mufflers are brought under control. Environmental noise pollution could be considerably abated if only we strengthen management, such as moving the location of noise pollution sources. We could confine noise to within a particular building; hang sound-absorbing boards around the noise, or paste sound-absorbing materials on the wall of the building concerned. Such simple devices can reduce noise pollution considerably.

Conditions are ripe in China for an all-out campaign to control noise pollution. The country has a large contingent of well-qualified researchers in the science and technology of environmental pollution control. It has put together a rudimentary production team for the construction of facilities to combat noise pollution. Nation-wide, there are over 80 factories in more than 10 provinces, municipalities and autonomous regions specializing in noise-reduction facilities. China also has the expert staff with professional knowledge to control noise pollution. We have promulgated a series of noise regulations.

To sum up, it is not only necessary but also feasible to promptly formulate and promulgate laws to control environmental noise pollution. We believe that quiet and comfortable living environment people long for will certainly emerge through the effort of the entire nation.

12581
CSO: 4008/128

STRENGTHENING OF ENVIRONMENTAL LAW ADVOCATED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 3, 1984 pp 5-7

[Article by Luo Dianrong [5012 0368 2837]: "Apply Legal Measures to Strengthen Environmental Management"]

[Text] At the Second National Environmental Protection Conference recently convened by the State Council, Vice Premier Li Peng [2621 7719] delivered a report on behalf of the council. He stated that environmental protection "is a strategic task in China's modern development and forms a major policy." He also advocated strengthening environmental law, stating, "It is not enough merely to say that environmental protection is important; we must use law to effect control. One of the important experiences of environmental protection abroad is the use of legal measures to manage the environment."

People increasingly realize that to improve environmental protection work we must strengthen the legal system. Law is a code of conduct that regulates social relationships and prescribes rights and duties in certain social relationships. Environmental law assigns rights and duties in the social relationships arising from environmental protection and determines what may be done in this area, what may not be done and what should be done. What is commonly known as environmental legislation is but the systematization and standardization of technological and other managerial experience in the field of environmental protection and the conferral of the form of law thereon by the organs of state power. Thus this legislation is inseparably interrelated with scientific, technical, economic and administrative measures. Naturally, we can draw upon foreign experience in this area, but we must rely primarily on the effective, accumulated managerial experience that suits China's realities. Those views that assume that complete environmental legislation is available right from the start are impractical. That, of course, is not to say that we cannot undertake legislation until we have a body of complete and mature technical, economic and administrative management experience. In most situations, we can undertake basic legislation in accordance with the experience China has accumulated and with reference to foreign experience. Then, in accordance with new experience, we can steadily supplement, revise and expand this legislation during implementation. We have made more progress in environmental legislation since the 3d Plenum of the 11th CPC Central Committee. There were provisions concerning environmental protection in the 1978 constitution and the new revision thereof promulgated in 1982. The Standing Committee of the People's Congress promulgated the (Trial) Environmental Protection Law of the PRC in September 1978 and the Marine Environmental Protection Law of the PRC in August 1982. The State Council has issued environmental quality standards for air, water and noise and discharge standards for a number of pollutants. At present, the Water

Pollution Prevention Law, the Air Pollution Law, the Urban Noise Control Law, the Regulations Governing Natural Preserves and the Regulations Protecting Wild Animal and Plant Life are being drafted or have been sent up for approval. And the 1979 (Trial) Forestry Law of the PRC, the Grassland Law, the Water Resource Law, the Mining Resources Law, the Urban Planning Regulations and the Land Law, which are currently being drafted, all contain provisions concerning the protection of the environment and of ecological balance. In addition, each province, municipality, autonomous region and department of the State Council has also formulated and promulgated numerous laws and regulations in accordance with local or departmental conditions. In order to meet the needs of the new situation, we are preparing to revise the (Trial) Environmental Protection Law of the PRC, which effort we expect will greatly strengthen the managerial authority of environmental departments at all levels. In short, China is rapidly moving toward a complete system of environmental law.

Due to long interference from the "left" and the wanton trampling of the legal system by the "gang of four" as well as to the incompleteness of current environmental legislation and to some provisions in the (Trial) Environmental Protection Law that overstep basic principles, China's environmental legal system has fallen far behind actual conditions, and we have failed by a large margin to make effective use of legal measures to manage the environment. Compared with other managerial methods, legal measures must be said to be the weakest link. Thus while much effort is being made to complete national legislation, each province, municipality and autonomous region should devote itself to developing local legislation, and relevant State Council agencies should synthesize experience within their jurisdictions and intensify their efforts to perfect and complete managerial methods and regulations suited to their departmental systems. China is vast, and conditions vary in each locality and department, producing different types of environmental problems. Thus there cannot be complete uniformity nationally, and many management laws and regulations await formulation or revision by localities and departments based on the particular conditions obtaining therein. In this fashion, top, bottom, left and right will start to work in unison, and we can look forward to a more rapid establishment of a complete system of environmental law.

Next, judicial, environmental and all relevant economic departments should work together to ensure enforcement of the law. The view that we should primarily rely on judicial departments to enforce environmental law is one-sided. For most environmental law is administrative in nature, and its implementation depends to a large degree on functional departments and administrative measures. Most of the legal problems involved in environmental protection are economic in nature and thus should be handled by environmental departments and economic management agencies in accordance with provisions in current environmental law. Naturally, in the process, we must strengthen communication and cooperation with judicial departments in order to obtain the last possible assurances of strong enforcement therefrom. All cases exceeding administrative jurisdiction must be independently handled by judicial agencies, with whom environmental protection and relevant economic departments should continue to cooperate,

providing, for example, specific details concerning cases, presenting pollution data and assisting in the execution of decisions. Such cooperation is necessary because environmental questions are very technical, involve many fields and require comprehensiveness. Thus close cooperation among the aforementioned agencies is a key to the success of the implementation of environmental law. Yet there are still many situations in which judicial departments feel that environmental issues are too difficult and that provisions in the law lack sufficient concreteness, and thus these agencies are frequently unwilling to get involved in and even refuse to accept environmental cases; in which economic departments tend to concentrate all their efforts on economic development, even viewing enforcement of environmental law as an externally imposed burden; and which frequently compel the principal force responsible for implementing environmental law, environmental protection agencies, to go into battle alone. Besides the facts that authority is more important than the law and that the law itself is incomplete, the primary problem here is that we lack sufficient understanding of the importance of environmental protection and the use of legal measures to manage the environment, and thus we have been unable to cooperate to preserve the environment and to enforce environmental law. There are, of course, commendable examples in which these objectives have been realized. In October 1979, the Suzhou Intermediate People's Court correctly fined the Suzhou People's (now the Anli) Chemical Plant 300,000 yuan and sentenced Zhang Changlin [1728 7022 2651], the person responsible, to 2 years imprisonment in a case involving serious pollution. This decision, which was achieved through the close cooperation and coordination between judicial, environmental and economic departments, greatly shook polluting plants in Suzhou. The city used the case as propaganda to educate leading cadres of all polluting plants and to promote pollution control. Now environmental cadres have strong backing, so their work is easier. There are many such examples throughout the country. Each locality could select one or two of these cases and use them to educate the broad masses of cadres and people; to raise understanding of the need to follow and enforce the law; to teach the cadres of judicial, environmental and economic departments; to nurture and strengthen these cadres' understanding of the importance of close cooperation and coordination; and to wage resolute struggle against all behavior that violates environmental law.

The Second National Environmental Protection Conference proposed that, by the end of the century, we must strive fundamentally to resolve national environmental pollution problems; to achieve a basically beneficial cycle in China's ecology; to make urban and rural productive and living environments clean, beautiful and peaceful; and to enable national environmental conditions basically to keep pace with economic development and the rise in material and cultural living standards. To achieve these struggle objectives, we must make full use of legal measures to strengthen environmental management. And in the work of improving the system of environmental law, the broad masses of legal theorists and judicial workers will bear especially important responsibilities.

12431
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LEGAL ASPECTS OF 'MARINE ENVIRONMENTAL PROTECTION LAW' EMPHASIZED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 7, 1983 pp 8-9

[Article by Feng Liqi [7458 4539 1142]: "Use Legal Means to Protect the Marine Environment"]

[Text] The "Marine Environmental Protection Law of the PRC" became effective on 1 March 1983. This is a starting point in our country's protection of the marine environment and also an important event in building China's legal system.

China is a coastal country with more than 18,000 km of coastline, many islands, a broad continental shelf and a vast sea area. It is rich in aquatic products, marine mineral resources and energy resources; there are many seaside tourist areas and its communications and navigation potential is excellent. The development, utilization and protection of the marine environment and its resources are an important task of our socialist modernization construction.

In the wake of China's oil exploration, exploitation, refining and other modern industries, as well as increased shipping, pollution of the sea is becoming a more and more prominent problem, and the pollution and damage to inland seas, sea ports and parts of the coast is particularly serious. According to incomplete statistics, China annually discharges 8 billion tons of industrial and human waste directly into the sea, of this amount, 2.1 billion tons are discharged into the Bo Hai and the Yellow Sea. Many toxic and hazardous substances, such as mercury, chromium, cadmium and cyanide, are continuously discharged into the sea, schools of fish are killed, toxic substances retained in the fish are increasing, fishing grounds are vanishing, production from aquatic breeding and the fishing industry is declining and human health is being threatened.

In recent years, China has done some work in protecting the marine environment. It has issued tentative regulations, and the various ports along the coast have also issued management regulations which have had a certain effect in preventing and controlling marine pollution. However, generally speaking, our work of protecting the marine environment is still a very weak link. Before this, China has had no unified law on protection of the marine environment. Therefore, the promulgation of the "Marine Environmental Protection Law" is bound to open up new prospects for China's protection of the marine environment.

Our "Marine Environmental Protection Law" consists of three parts. The first part contains general principles, which, first of all, state that the purpose of the present law is to protect the marine environment and resources, prevent damage and pollution, protect the ecological balance, safeguard human health and promote maritime undertakings. The sphere of application of the present law comprises the inland seas and territorial waters of the PRC and all other sea areas under the jurisdiction of the PRC. The law furthermore stipulates that it shall also apply to the discharge of hazardous substances and waste materials outside of China's territorial waters if such actions cause damage and pollution in ocean areas under the jurisdiction of the PRC. In view of the special nature of marine pollution and the real damage caused by it, this extended sphere of the law's application is absolutely necessary; antipollution laws of other countries also have similar provisions. The first part of our law furthermore establishes a division of labor with regard to the protection, management, monitoring of the marine environment, and handling of accidents and legally clarifies the scope of functions and powers of the various departments concerned.

Toxic and hazardous substances in the ocean originate mainly from the following sources: the discharge of waste material in connection with on-shore construction projects, which includes the construction of harbors and wharves, water conservation work on river mouths and the development and utilization of tidal marshes; off-shore oil exploration and development, spills during transportation and the discharge into the sea of waste water and waste material by units along the coast; spills and discharge from ships; dumping of waste materials into the sea. The second part of the "Marine Environment Protection Law" contains special provisions and demands with regard to ways to prevent and control the occurrence of pollution mentioned above. Every unit, individual or ship engaged in any undertaking or navigation on the ocean under the jurisdiction of the PRC is obliged to abide by the above-mentioned provisions of the law.

The third part of the "Marine Environmental Protection Law" stipulates the legal responsibility if damage and pollution is caused by a violation of the above-stated rules and requirements. Anyone who violates the provisions of the present law and causes damage and pollution must pay to clear up the pollution, and compensate for damages. Apart from warnings and fines, the person directly responsible for severe damage to public or private property or for causing injury or death to other persons, shall additionally be subjected to investigation by the judicial authorities as to his criminal liability. The law also provides that any unit or individual that suffers losses due to pollution, may institute legal proceedings and claim compensation according to the procedure of the "Code of Civil Procedure of the PRC," and thus have all lawful rights and interests legally protected. Since there was no legal basis for handling cases of marine environmental protection in recent years, the legal liability of persons causing damage and pollution was never investigated, and cases of marine pollution increased without letup. To have a complete set of legal provisions, it was absolutely necessary to have the third part of the law as it provides the legal basis for the effective prevention and punishment of the illegal pollution of the marine environment.

For the international settlement of cases of environmental pollution, there are two "P P P" principles. One is the "polluter-pay-principle," which means the polluter may be charged all expenses, a tax and compensation for damages. The other is the "punish-polluter-principle," which means that apart from the polluter's civil law liability to pay expenses and compensation for damages, other sanctions may be imposed on the party directly responsible. For instance, the Japanese "Law on Ensuring Compensation for Oil Pollution Damage" specially prescribes in chapter 7 "Penalties" that violaters shall be sentenced to hard labor or fined, depending on the gravity of the circumstances. This shows that the latter principle is even more severe on polluters.

Because of the seriousness and special nature of pollution damage, the traditional legal principles of civil law have been changed here with regard to compensation of damages. The principle generally adopted in civil law is the principle of liability for fault, that means, if damage occurs, the victim when exercising his right to claim compensation, must first assume the responsibility of producing evidence. He must prove: (1) That the person who caused the damage had intentionally or negligently committed an illegal act; (2) that there is a causal relation between the illegal act and the damage; (3) that the injured party had taken action to avoid the damage, that is, that he was not doing anything intentionally or negligently. If this system of requiring the plaintiff to produce evidence is upheld, not only is the victim of pollution put in an extremely unfavorable position, but it also implies that the polluter need not bear any responsibility before the plaintiff produces sufficient evidence of the polluter's intention or negligence. This would amount to an encouragement to enterprises to plunder natural resources and pollute the environment without giving any consideration to the possible consequences. Some countries have, therefore, made the following changes in their law: In pollution cases, the burden of proof shall be on the defendent, that means, the polluter must prove that the pollution was brought about by certain causes which according to law would absolve him from responsibility, otherwise he must bear responsibility regardless of whether he acted intentionally or negligently, and this furthermore establishes the principle of an assumption of causality. The provisions of our "Marine Environmental Protection Law" basically conform with the above-stated principles, but its concrete enforcement provisions still await future enactment and enforcement.

Internationally, legislation on the prevention of pollution of the marine environment began in the 1950's and does not have a long history, but it was quick in developing. Especially the pollution incident of the oil tanker "Torrey Canyon" in 1967 gave impetus to worldwide pollution legislation. In the more than 10 years since that accident, there have been five international agreements, concluded under the auspices of the UN Conference on the Law of the Sea, which deal with the prevention and treatment of oil pollution on the oceans (not including regional agreements). Antipollution legislation in the various countries also emerged "like bamboo shoots after a spring rain," countries vying with each other in such legislation. This fact fully demonstrates the great importance that mankind attaches to the protection of the marine environment and also the important role that the legal system plays in the prevention and treatment of cases of marine pollution.

Protection of our seas, rivers and lakes from pollution is the duty of all units and citizens. Our entire people, especially the trades and industries along the coast, must conscientiously study and implement our "Marine Environmental Protection Law." They must act on the principle that a law must be complied with and must be conscientiously observed. All judicial and administrative departments must deal sternly with all illegal acts of pollution of our seas and rivers. They must act on the principle that law violaters must be prosecuted and enforcement of the law must be strict, so as to contribute to the protection of our country's marine environment and natural resources and to provide benefits for future generations.

9808
CSO: 4008/208

ENVIRONMENTAL PROBLEMS, CONTROL MEASURES IN ALLUVIAL-GOLD MINING

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 3, 1984 pp 10-12, 15

[Article by Chen Changxing [7115 7022 5281], Ding Jianfeng [0002 0494 1496], Wang Mengchang [3769 1322 0863] and Guan Youcai [7070 2589 2088]: "Environmental Problems and Control in Alluvial-Gold Mining"]

[Text] China's gold reserves consist of "mountain" and "alluvial" gold, and placer mining is an important means of producing gold in China.

Nevertheless, the development and exploitation of alluvial gold reserves has produced a series of environmental problems that are distinctive of the industry. We recently conducted surveys of key placer gold mines in China's northeastern region, studying current environmental conditions, pollution load and the threat of pollution. The results of these surveys indicate that environmental problems in placer-mining districts are growing increasingly severe and warrant proper attention from the departments concerned.

I. Current Environmental Problems in Placer-Mining Districts

Alluvial gold is extracted through opencut mining, which causes two general types of environmental problems: impairment of the land-surface environment by gold tailings produced during excavation and pollution of water systems by tailing water produced in hydraulic washing.

1. The Drastic Reshaping of the Land Surface Caused by Placer Mining

The pile dredge has been employed in most of China's placer mining, and water pumps and vertical shafts have also been used to a lesser extent. The pile dredge includes no refill equipment and turns up gold-bearing ore from depths of 5 to 12 meters. After washing, gold tailings are cast as piles of backfill, which consist primarily of gravel, cobbles and silt and range from 3 to 5 meters in height and from 40 to 60 meters in width. Thus excavation paths have become banks of waste fill.

Alluvial gold-ore grade usually ranges between 0.1 g/m^3 to 0.3 g/m^3 and averages 0.2 g/m^3. Thus production of 1 liang of gold requires 160 cubic meters of ore, and a medium-sized mine with an annual production of 10,000 liang of gold excavates as much as 1.6 million cubic meters of ore a year. With the rise in gold production, tailing piles have grown year after year, eventually covering much land and forming a man-made wasteland. In situ surveys of 5 key placer-mining districts in Heilongjiang reveal that between 1971 and 1980 24.15 million cubic meters of earth were excavated and that tailing banks covered 3.45 million square meters in these districts alone.

Hua'nan Mine has been in operation for more than 60 years. According to surveys, tailings cover 3.5 million square meters at this mine, of which area 500,000 square meters were excavated through rapacious imperialism during the Japanese puppet era, and the other 3 million square meters were produced after liberation.

The large expanse of tailing banks drastically reshapes the land in mining districts. Such banks criss-cross these districts and leave the surface cragged. In addition, the pits created by sump-digging and the huge spoil piles produced in vertical-shaft excavation despoil the original appearance of mining districts, seriously reduce environmental quality in these districts and alter the configuration of their land, river beds and roads.

2. Tailings Take Up Much Land and Seriously Reduce Land-Use Value

Alluvial gold ore is generally distributed in the flood land of river valleys and low-lying land in the mountains. Some sectors in these areas have been cultivated for many years, while others are virgin land awaiting development. Placer mining uses much land, destroys large expanses of grassland and forests and directly harms agriculture, herding and ecological balance. According to surveys at the Hua'nan Gold Mine, tailings there transformed 2 million square meters of agricultural land, 1 million square meters of grassland and swamps and 500,000 square meters of secondary forests into gravel banks, thus greatly damaging agriculture and prairie ecology.

It should be especially noted that most of the land surface destroyed by dredges is difficult to restore and that grasslands and secondary forests so damaged are hard to regenerate in a short period of time, because tailing piles are largely covered with gravel and cobbles. Thus land refill and cultivation are extremely difficult, and many of these areas become barren wastelands.

According to an investigation by the Hanjia Yuanzi Mine of the Huma Gold Mine Bureau, not a single inch of grass grows on the tailing piles created in recent years, only a small amount of cyperus amuricus has grown up in the piles created during the 1960s and only some stunted shrubbery can be found in those created during the Japanese puppet era. Thus reducing mine land use as much as possible and portecting land, grassland and secondary forest resources are crucial problems in placer mining.

3. Hydraulic Washing Seriously Impairs Surface Water and Damages Water Resources

Placer mining employs the "panning" technique, and the tailing water produced thereby contains much silt, suspended sediment, COD material, grass roots, tree bark and other miscellaneous substances, all of which contaminate surface water.

Surveys reveal that during the production season (May through November) the 6 dredges and 1 sump at Hua'nan Mine alone discharge 18,200 tons of wastewater per day, which enters rivers and impairs water quality. Table 1 presents water monitoring results from the Qihuli He at Hua'nan Mine.

Table 1. The Results from Water-Quality Monitoring in the Qihuli He*

Items Monitored		Monitoring Locations					
Item	Unit	1	2	3	4	5	6
Turbidity	degree	30	5,000	3,000	160	5,200	8,000
Suspended solids	mg/1	30	1,163	1,228	94	2,454	2,868
Total solids	mg/1	220	1,310	1,414	286	2,944	4,350
COD_{Cr}	mg/1	17.97	130	134	26	112	196
Item	Unit	7	8	9	10	11	12
Turbidity	degree	6,400	2,286	2,286	128	4,000	1,455
Suspended solids	mg/1	2,320	1,022	1,762	103	2,210	688
Total solids	mg/1	3,508	1,670	1,912	228	3,056	934
COD_{Cr}	mg/1	121	75	70	12	56	20

*These comprise 4 of the 14 items monitored in the Qihuli He. With the exception of location 1, the other locations are all polluted sections.

These results indicate that mining operations seriously impair water quality in the Qihuli He. In each polluted section, turbidity average 3,443 degrees, exceeding the number-1 clean-water index 115-fold. Suspended-solid content averages 1,446 mg/1, exceeding this index 48-fold; total solid content is 1,964 mg/1, 8.9 times higher than this index, and COD content is 86.5 mg/1, or 4.8 times higher.

The degradation of water quality poses a direct threat to aquatic life. When suspended-solid content is high, light transmittance is reduced in river water, thus affecting photosynthesis and endangering aquatic life. Suspended sediment also clogs the gills and threatens the survival of fish. Surveys of the Fabiela He at Heihe Gold Mine indicate that shipbuilding and mining in the upper reaches of this river create intolerable water turbidity, and thus fish have vanished from the downstream section, which is several 10s of li in length. And according to incomplete statistics, during the 1960s the Qihuli He had many species of and produced much fish, but in recent years the river's fish population has steadily declined, and fish have disappeared from the gold-producing section of the river.

4. Placer Mining Has a Deleterious Effect on the Natural Landscape

Placer mining disfigures the land surface, takes up much land, destroys natural vegetative cover, pollutes rivers and thus inevitably produces serious consequences for the natural landscape. Green plants, such as those of prairies and fruticeta, regulate ecology in many ways, produce

large changes in humidity, moderate temperature fluctuation, reduce wind, check sand storms and conserve moisture. Placer mining harms secondary forests, grasslands, marshes and land, causes proportional imbalances--on the one hand affecting the local microclimate and on the other altering the surrounding environment--and thus destroys the vibrant natural environment. The large expanses of rock piles that have appeared in the Qiupigou area, for example, are a common sight in all mining districts.

Mining along rivers causes especially severe damage to the natural landscape, widening river beds, destroying the land, changing hydraulic conditions and engendering serious erosion of river banks and soil.

5. Other Pollution Problems

In addition to the general environmental problems described above, mining also causes localized pollution or pollution specific to certain mines, such as noise pollution in dredges and radioactive pollution in heavy-ore dressing (which has occurred only at Hua'nan Mine, where naturally radioactive thorium has been discovered) and the like. If not strictly controlled, these problems can also pose a threat within certain areas and therefore warrant proper attention.

II. Suggestions for Controlling Pollution in Placer Mining

In summary, once produced, the environmental problems of placer-mining districts are hard to reverse, make land-resource development difficult and create trouble for future generations. We must adopt effective measures to control these problems in a planned way.

Thus, in accordance with the special characteristics of these problems and China's current technological and economic conditions, we offer the following control proposals.

1. Enterprises developing placer mines should establish overall and long-range points of view and conduct comprehensive general surveys of land, grassland, forest and water-system resources in surrounding areas. For mining work itself, we should make unified long-range plans, rational arrangements, proper extraction plans and effective site-restoration measures; we should avoid stressing one thing to the detriment of others; and we should strive to reduce damage to other resources caused by the exploitation of gold reserves. We suggest that a certain amount of money be allotted from each year's production expenditures for investment in environmental protection and control. This would provide an economic guarantee for the amelioration of environmental problems in placer mines.

2. We should vigorously implement technological transformation and innovation and steadily adopt more advanced excavators and extractive technology. The newly introduced 300-liter chain-bucket (head-rope) barge, for example, is installed with filling equipment, grades and

refills tailings more effectively and limits pile peaks, usually to between 0.5 and 1.0 meters. Tailing surfaces thus will be more level and can be covered with sand, clay and the like and provide a basis for further reconstruction. We suggest that before extraction is initiated bulldozers be used to strip off topsoil, which can be used to re-cover the site and grow grass, trees or crops when mining is completed.

3. Existing tailing piles should be comprehensively surveyed and classified according to surface soil conditions. In areas where gravel, cobbles or stoniness predominate, adaptable plants that can endure harsh environments may be grown, or the areas can also be temporarily abandoned. Where soil conditions are better, gravel and cobbles less common and surfaces smoother, we should carry out planned leveling and grass and tree planting, transform harm into benefit and make steady improvements.

Sump pools can be made into fish ponds, around which trees can be planted to improve the landscape.

4. We should appropriately utilize the advantages of each area, adopt simple water-treatment techniques and control tailing-water pollution. For example, we can construct tailing-water impoundments, deepen base pits, lengthen drainage sluices, filter ore, install chemical cement-mixing equipment on excavators and so on.

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EFFECTS OF ELECTROMAGNETIC POLLUTION ON HUMAN HEALTH DISCUSSED

Beijing BEIJING YOUDIAN XUEYUAN XUEBAO [JOURNAL OF BEIJING INSTITUTE OF POSTS AND TELECOMMUNICATIONS] in Chinese No 1, 1982 pp 116-125

[Article by Gao Yougang [7559 2394 4854]: "The Harmful Effects of High-Intensity Electric Fields on the Human Organism--On the Problem of Electromagnetic Pollution"]

[Text] Abstract

In this paper the harmful effects of high-intensity electric fields on human beings are discussed. Formulas for determining the field strength of high voltage transmission lines and track lines and experimental data of these effects on mice are given. Protective measures from these hazards are introduced.

Introduction

In recent years, foreign countries have been actively developing environmental protection research. China is a socialist country and the Party Central Committee is always concerned about the physical and mental health of the working population, and environmental protection will undoubtedly receive even more attention in the future. Various provinces and municipalities in China have begun to pay attention to this work, for example, in 1981 alone Beijing has achieved a number of research results on environmental protection. However, an important factor in environmental pollution--electromagnetic pollution--has not received adequate attention. This paper is written to advocate the development of electromagnetic pollution research so that standards and protection measures may be established as soon as possible to improve the health of the Chinese people.

I. Field Strength of Industrial High-Intensity Electric Field

As is well known, strong electric fields exist in the vicinity of high voltage transmission lines and track lines. Due to the interplay of capacitance, inductance and impedance, such electromagnetic fields affect the communication network. In less severe cases, it can cause interference and degrades the signal quality, in more severe cases it can damage communication equipment and jeopardize personnel safety when humans are in contact with the affected

equipment or entering the danger zone of high electric field. Discussions in this area can be found in numerous literature (e.g. Refs. 1-6 and 18) and will not be repeated here.

Recent medical studies in foreign countries have shown that high-intensity electric fields have harmful effects on human health even when the human body is not in contact with the affected equipment and not in the danger zone of high electric potential. The harmful effects are mainly caused by the electric field and not by the magnetic field. According to a West German medical report, residents near high voltage transmission lines and track lines suffer blood and nerve system disorders due to the long-term exposure to the intense electric field. Electromagnetic pollution has caused some deaths. The Soviet Health Department has established exposure time standards for people in a high intensity electric field environment (see Table 1).

Table 1

Field strength (kV/m)	5	10	15	20	25
Permissible Exposure Time	no limit	3 hrs or less	1.5 hrs or less	10 min or less	5 min or less

The Table above shows that there is no time limit for exposure to field strength less than 5kV/m. This applies, however, only to circuit maintenance crew and does not take into account the long-term exposure effects of the residents. Further studies are needed to establish a standard for long-term effects.

Railroads and electric power are important areas in China's four modernizations. The basic requirements of railroad modernization are to increase the weight, speed and density. For these reasons, the railroad departments are developing electric locomotives and trying to achieve electrification for a number of trunk lines and mountain area railways. In addition to the 110kV and 220kV high-voltage transmission line networks which already cover China, the electric power department has also built 330kV transmission lines in the northwestern region a few years ago and 500-750kV transmission lines are under active planning for the northeastern region and for central and southern China. There is no doubt that the problem of industrial high intensity electric field affecting human health will become more acute. Here we first introduce the method for determining the field strength around high voltage wires so that the design engineers may choose the best circuit routing and structure to minimize the harmful effects.

(1) Field intensity effects on humans by track lines and single-wire ground type transmission lines

In Fig. 1, 1 represents the high voltage wire and 1' is its mirror image. From Maxwell's equation for electrostatics, the potential of any point in space, P(x,y), can be easily found:

$$\varphi(x,y) = \frac{U_1}{n_{11}} n_{1p} \quad \text{(in Volts)}$$

and the magnitude of the electric field intensity at P(x,y) is

$$E = \frac{2bU_1}{n_{11}\sqrt{x^4 + y^4 + b^4 + 2b^2x^2 + 2x^2y^2 - 2b^2y^2}} \quad \text{(in Volts/meter)}$$

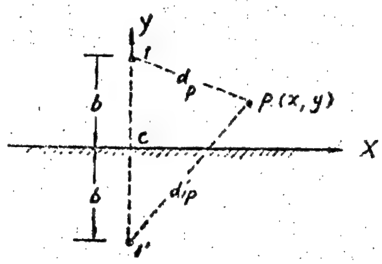

Fig. 1

In the equation above, U_1 is the voltage (in volts) of the wire with respect to ground, $n_{11}=\ln(2b/r)$ is the self-potential coefficient, b is the distance in meters from the wire to the ground surface, r is the effective radius of the wire in meters, $n_{1p}=\ln\sqrt{\dfrac{x^2+(b+y)^2}{x^2+(b-y)^2}}$ is the mutual-potential coefficient, x is the horizontal distance in meters from point P to the wire and y is the distance in meters from point P to the ground. For a person standing on the ground, the average value of y is 1.8m. When $x=0$ and $y=1.8$m, the maximum field strength experienced by the human body is

$$E = \frac{2bU_1}{n_{11}(b^2-3.24)} \quad \text{V/m}$$

(2) Field strength of dual wire ground type transmission line

As shown in Fig. 2, 1 and 2 are respectively the conducting wires and 1' and 2' are their mirror images. The distance from the conducting wire to the ground surface is b and the wires are separated by a distance S. The voltage of the wire is U volts.

Using Maxwell's electrostatics equation, the potential at any given point P(x,y) in space can be found:

$$\varphi(x,y) = \frac{\sqrt{3}\,(n_{1p} + n_{2p})U_l}{2(n_{11} + n_{12})} + j\,\frac{(n_{1p} - n_{2p})U_l}{2(n_{11} - n_{12})}$$

$$\frac{\partial\varphi}{\partial x} = \frac{\sqrt{3}\,U_l}{4(n_{11} + n_{12})}\left\{\frac{S + 2x}{\left(\frac{S}{2} + x\right)^2 + (b + y)^2} - \frac{S + 2x}{\left(\frac{S}{2} + x\right)^2 + (b - y)^2}\right.$$

$$\left. - \frac{S - 2x}{\left(\frac{S}{2} - x\right)^2 + (b + y)^2} + \frac{S - 2x}{\left(\frac{S}{2} - x\right)^2 + (b - y)^2}\right\}$$

$$+ j\,\frac{U_l}{4(n_{11} - n_{12})}\left\{\frac{S + 2x}{\left(\frac{S}{2} + x\right)^2 + (b + y)^2} - \frac{S + 2x}{\left(\frac{S}{2} + x\right)^2 + (b - y)^2}\right.$$

$$\left. + \frac{S - 2x}{\left(\frac{S}{2} - x\right)^2 + (b + y)^2} - \frac{S - 2x}{\left(\frac{S}{2} - x\right)^2 + (b - y)^2}\right\}$$

$$\frac{\partial\varphi}{\partial y} = \frac{\sqrt{3}\,U_l}{2(n_{11} + n_{12})}\left\{\frac{b + y}{\left(\frac{S}{2} + x\right)^2 + (b + y)^2} + \frac{b - y}{\left(\frac{S}{2} + x\right)^2 + (b - y)^2}\right.$$

$$\left. + \frac{b + y}{\left(\frac{S}{2} - x\right)^2 + (b + y)^2} + \frac{b - y}{\left(\frac{S}{2} - x\right)^2 + (b - y)^2}\right\}$$

$$+ j\,\frac{U_l}{2(n_{11} - n_{12})}\left\{\frac{b + y}{\left(\frac{S}{2} + x\right)^2 + (b + y)^2} + \frac{b - y}{\left(\frac{S}{2} + x\right)^2 + (b - y)^2}\right.$$

$$\left. - \frac{b + y}{\left(\frac{S}{2} - x\right)^2 + (b + y)^2} - \frac{b - y}{\left(\frac{S}{2} - x\right)^2 + (b - y)^2}\right\}$$

where $n_{1p} = \ln\sqrt{\dfrac{\left(\frac{S}{2} + x\right)^2 + (b + y)^2}{\left(\frac{S}{2} + x\right)^2 + (b - y)^2}}$ is the mutual potential coefficient

between point P and wire 1, and $n_{2p} = \ln\sqrt{\dfrac{\left(\frac{S}{2} - x\right)^2 + (b + y)^2}{\left(\frac{S}{2} - x\right)^2 + (b - y)^2}}$ is the mutual

potential coefficient between point P and wire 2, $n_{11}=\ln(2b/r)$ is self-potential coefficient of the wire, $n_{12}=\ln\sqrt{1+\frac{4b^2}{S^2}}$ is the mutual potential coefficient between the two conducting wires, r is the radius of the wire, in meters, and b, S, x, and y are all in meters.

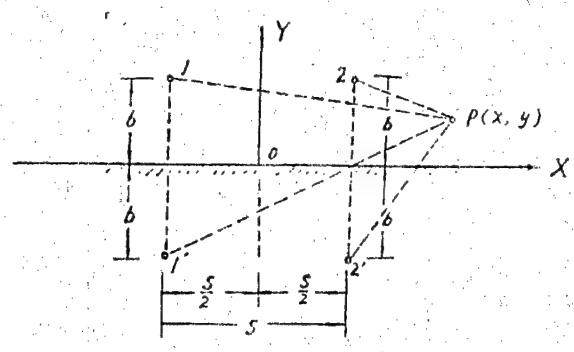

Fig. 2

The magnitude of the electric field strength at point P is obtained by substituting the values of $\frac{\partial\varphi}{\partial x}$ and $\frac{\partial\varphi}{\partial y}$ into the following equation:

$$E=\sqrt{\left|\frac{\partial\varphi}{\partial x}\right|^2+\left|\frac{\partial\varphi}{\partial y}\right|^2}$$

(3) Field strength of a three-phase symmetric transmission line in normal operation

In the first two cases we just described the effects on human health by the asymmetrically placed wires are discussed. In an asymmetric system, since there always exists an unbalanced voltage, the effects on human cannot be ignored. The situation is different for a three-phase symmetric transmission line under normal operation. In this case, even though the unbalanced voltage can be neglected, there may still be a relatively large electric field strength because the three conductors are at very high voltage relative to the ground and they are in general not symmetric with respect to the geometric location of the human body. Long term effects on humans may still be harmful.

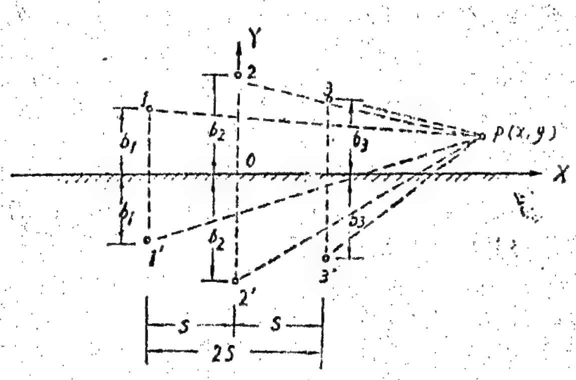

Fig. 3

In Fig. 3, 1, 2 and 3 represent respectively the three conductors and 1', 2', and 3' are their mirror images. S is the horizontal distance between the conductors (in meters) and U is the line voltage of the system (in volts). Similar steps lead to:

$$\frac{\partial\varphi}{\partial x} = -\frac{U_l}{\sqrt{3}\,(n_{11}-n_{12})}\left\{\left(\frac{x+S}{(x+S)^2+(b_1+y)^2}-\frac{x+S}{(x+S)^2+(b_1-y)^2}\right.\right.$$
$$+(0.5+j0.866)\left(\frac{x}{x^2+(b_2-y)^2}-\frac{x}{x^2+(b_2+y)^2}\right)$$
$$\left.+(0.5-j0.866)\left(\frac{x-S}{(x-S)^2+(b_3-y)^2}-\frac{x-S}{(x-S)^2+(b_3+y)^2}\right)\right\}$$

$$\frac{\partial\varphi}{\partial y} = -\frac{U_l}{\sqrt{3}\,(n_{11}-n_{12})}\left\{\left(-\frac{b_1+y}{(x+S)^2+(b_1+y)^2}+\frac{b_1-y}{(x+S)^2+(b_1-y)^2}\right)\right.$$
$$-(0.5+j0.866)\left(\frac{b_2-y}{x^2+(b_2-y)^2}+\frac{b_2+y}{x^2+(b_2+y)^2}\right)$$
$$\left.-(0.5-j0.866)\left(\frac{b_3-y}{(x-S)^2+(b_3-y)^2}+\frac{b_3+y}{(x-S)^2+(b_3+y)^2}\right)\right\}$$

Upon substituting $\frac{\partial\varphi}{\partial x}$ and $\frac{\partial\varphi}{\partial y}$ into the following equation, we have the magnitude of the field strength at any point P(x,y):

$$E = \sqrt{\left|\frac{\partial\varphi}{\partial x}\right|^2 + \left|\frac{\partial\varphi}{\partial y}\right|^2}$$

where n_{11} and n_{12} are respectively the self-potential coefficient of the wire and the mutual potential coefficient between the wires.

For a person standing on the ground, we can still take y to be 1.8m. At the mid-point between two posts the field strength is the highest because the wires are closest to the ground. At the posts the field strength is the weakest because the wires are farthest from the ground.

For a three-phase symmetric transmission line in a three-point arrangement (see Fig. 4a), $b_1 = b_3 = b$ and $b_2 = b + d$.

For a three-phase symmetric transmission line in a horizontal configuration (see Fig. 4b), $b_1 = b_2 = b_3 = b$.

For a three-phase symmetric transmission line in a vertical configuration (see Fig. 4c), $S = 0$, $b_1 = b - d$, $b_2 = b$, and $b_3 = b + d$.

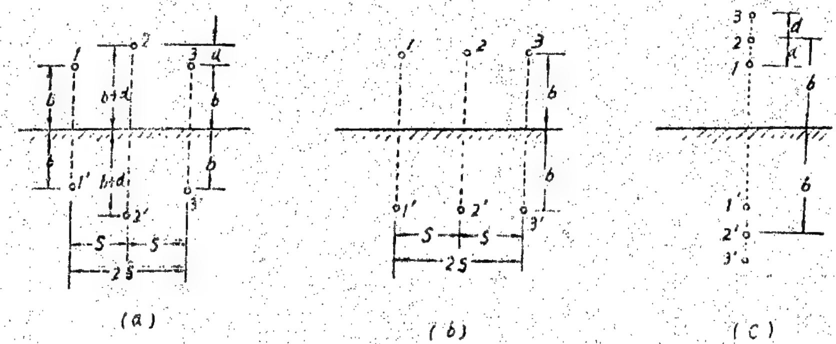

Fig. 4

Figures 5 and 6 show the calculated results of the field strength for the horizontal three-phase symmetric transmission line. In the calculation y is taken to be 1.8m, the distance between the posts is 400m and the transmission line data are shown in Table 2. To ensure the safety of the workers, we take $E \leq 5000V/m$. For a 330kV transmission line, the distance between the worker and the sideline, x-S, should be at least 6m. For a 500kV transmission line, the safe distance is 10m.

Table 2

Transmission line data		Phase voltage	Distance between wires S(m)	Number of wires per phase	Effective radius r(m)	Hanging height b(m)	Mid-point height (m)
Line voltage	330kV	190kV	9.1/18.2	2	0.074	22	7.5
	500kV	289kV	12.5/25	3	0.13	22	8

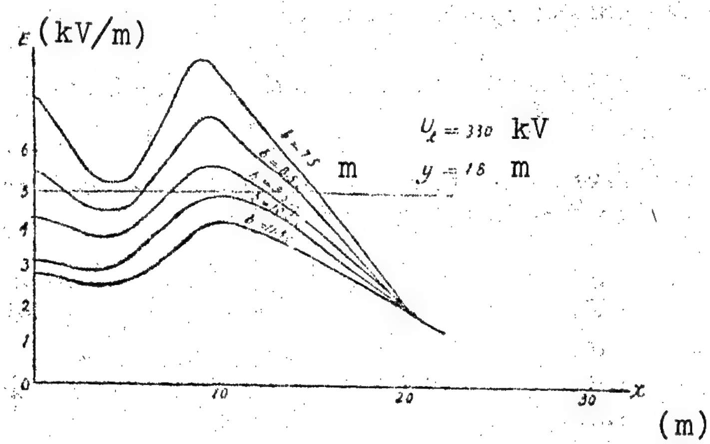

Fig. 5

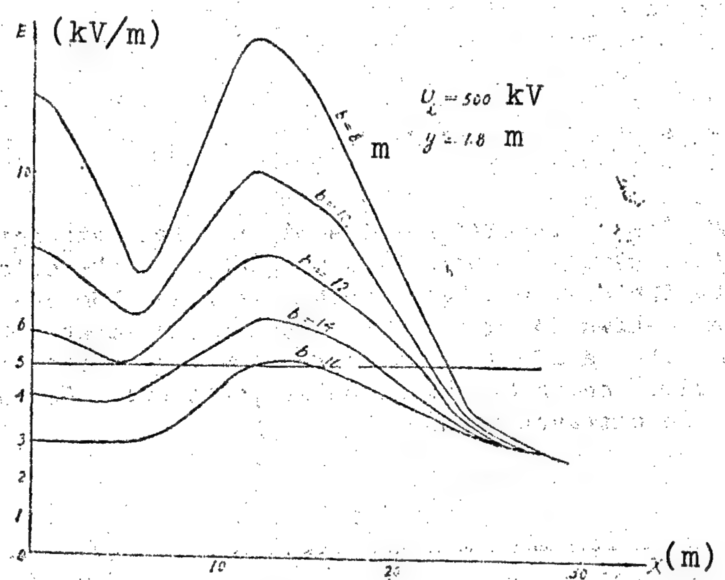

Fig. 6

II. Experimental Data of Physiological Effects on Mice Due to Electric Field

In order to study the long-term effects on human health by strong electric fields, experiments have been conducted in foreign countries using mice. In these experiments the mice population was divided into two groups, one group is directly exposed to high intensity electric field and the other group is protected from such radiation. The living condition of the two groups is observed and compared in the analysis. Observations show that the effect on female mice is greater and obvious differences are noticed in terms of water intake, rate of growth, body weight and white blood cell count. The results are listed in Tables 3, 4 and 5.

Table 3 Daily water intake (ml)

Weeks	Male		Female	
	Exposed	Protected	Exposed	Protected
1	3.90	4.23	3.76	4.51
2	3.78	4.29	3.71	4.14
3	3.66	4.31	3.64	4.21
4	3.96	4.63	3.82	4.38
5	4.14	4.79	3.59	4.23
6	4.43	5.06	3.35	4.46
7	4.45	4.99	3.54	4.32
8	4.43	5.16	3.23	4.37
9	4.69	5.29	3.18	4.32

Table 4 Average body weight (g)

Age (days)	Male		Female	
	Exposed	Protected	Exposed	Protected
53	25.83	26.38	24.65	25.58
65	29.04	29.92	25.73	28.42
72	30.44	30.58	26.24	29.15
79	31.70	31.21	27.85	29.73
86	32.74	32.38	28.58	30.69
93	33.61	34.13	28.69	32.08
100	34.39	34.50	28.00	31.89
108	35.17	35.25	28.12	33.08
116	36.04	36.29	28.00	32.42
123	37.39	37.21	28.19	33.42

Table 5 Blood condition

	Male		Female	
	Exposed	Protected	Exposed	Protected
WBC	5.51	5.51	3.55	6.80
RBC	7.41	7.12	8.10	8.16

It should be pointed out that current literature does not contain sufficient and consistent data on the mechanism by which the high intensity electric field affects human health. For example, West German, Soviet and Spanish researchers all believe that high intensity electric field at the working frequency definitely has an effect on human health, whereas some European and American researchers believe that electromagnetic pollution is serious near power stations but not so severe near transmission lines. Further investigation is needed.

III. Electromagnetic Pollution Due to High-Frequency High-Intensity Electric Fields

The harmful effects of high frequency high intensity electric field on human health received attention as early as World War II. The effect is mainly a thermal effect. The body organism heats up upon receiving the high frequency energy and the blood flow increases. It leads to cataract in the eye and loss of hair; the brain, the nervous system, the skin, the hypodermic structure and tissue can all be affected. Foreign researchers have found at least ten symptoms attributable to high frequency electromagnetic pollution:

Mental and behavoir disorder--This may be caused by very low level of electromagnetic radiation. Czechoslovakian and Soviet studies have shown that workers exposed to low intensity radiation suffer from insomnia, mania, amnesia, nervousness and fatigue.

Reproductive disorder--Female workers exposed to microwave give birth to more girls than boys and some become infertile for the rest of their lives.

Hereditary effects--It was discovered that if one of the parents is exposed to long-term high frequency radiation, the percentage for having deformed children becomes abnormally high.

Cataract--Cataract often occurs in the eye that is used to inspect microwave transmitter tube or equipment.

Cardiovascular disease--Workers exposed to microwave radiation often have low blood pressure, slow heart rate, decreased heart function and sometimes vascular problems accompanied by insufficient circulation in the coronary and in the brain.

Cancer--Microwave experiments on mice showed that the radiation leads to irregular increases in white blood cell, similar to that of leukemia.

In the United States many experts are concerned about the increased number of television transmitters and the sales of microwave ovens. The General Electric Company has agreed to repair or replace, free of charge, 36,000 microwave ovens that had a leakage level above 5mW. The number of microwave transmitters is constantly going up and television and FM transmitting towers put the environment in a "microwave shower." This "shower" also contains

microwaves from communication satellites, computer networks and industrial and agricultural microwaves. The level of radiation near military monitoring systems is also high. In 1954 an aircraft technician walked through a radar beam and was fatally injured.

Foreign countries have established a reference standard for high frequency (10MHz to 50GHz) radiation, see Fig. 7. The dotted lines show the boundaries for different situations. If the ambient temperature is high, the left dotted line is used and if the ambient temperature is very low or if the wind speed is high, then the dotted line on the right should be used. But this standard applies only to maintenance personnel exposed to high frequency fields for a brief period of time, it does not apply to long-term exposure. There have been reports that radiation power levels lower than 1 percent of the value in Fig. 7 may still cause electromagnetic pollution or disease.

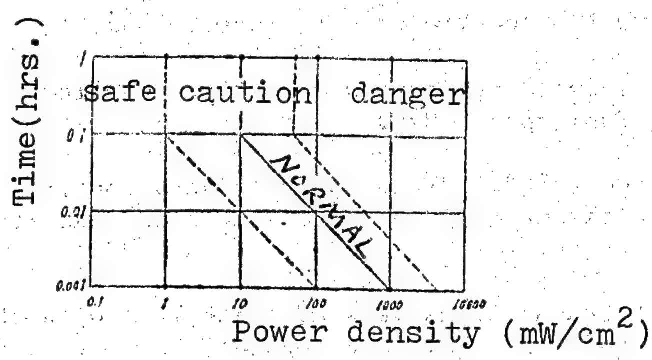

Fig. 7

IV. Protective Measures

Maintenance personnel should take protective measures when the field intensity exceeds the allowed standard to prevent harmful effects. Wearing a shielded helmet or wearing a shielded gown are examples of protective measures. Residents living near transmission lines should take appropriate precautions depending on the intensity of the electric field.

The following steps may be taken to guard against the harmful effects of high frequency radiation:

1. Determine the amount of high frequency radiation per unit area in the work place.

2. Install warning signals at the appropriate places.

3. Install fences around the danger zone.

4. Turn off the high frequency source when repairs are needed in the danger zone.

5. If the high frequency source cannot be shut off, then protective garments should be worn and the output of the source should be reduced to a safe level.

6. Whenever possible, shields should be installed at the side lobe or rear lobe to reduce the amount of radiation.

7. Conduct tests.

8. Periodically check the health of personnel working in a high frequency and high intensity electric field environment and keep detailed records.

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9698
CSO: 4008/195

REGIONAL SYSTEM FOR COMPREHENSIVE TREATMENT OF EFFLUENT

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 2, 1983 pp 23-25

[Article by Xiao Yilong [6730 5030 7127] of the Scientific Research and Monitoring Institute of Environmental Protection, the Ministry of Agriculture, Animal Husbandry and Fishery: "A Discussion on a Regional System for Comprehensive Control of Effluent and Its Plans"]

[Text] The strategic goal for the next 20 years requires us to create a new situation in effluent treatment. The key in the creation is to select correctly ways that suit China's national conditions. After weighing the strong points and limited factors of two technological ways--separate treatment and natural methods of purification, I believe that a regional system for comprehensive effluent control is a realistic plan.

A comparison between the same kinds of industries in China and developed countries shows that the amount of water used in China is three times more. Industry uses 60 to 70 percent of its water for cooling and air-conditioning; basically, it is not polluted after use. The re-utilization rate of water in industries abroad is more than 75 percent, but in China it is about 20 percent. The above factors have made products of China's industrial and mining enterprises low in quantity, poor in quality, high in cost and large in expenditure. A great amount of energy and resources become the three industrial wastes, this is the principal cause for the country's industrial pollution.

By region is meant the water sources or its supply areas of a town, city or an industrial area, the pollution sources, the effluent receiving farmlands and waters. The geographical location, natural conditions, economic and technical levels of the region are all deciding factors in making long-term plans and in industrial distribution, and affect the characteristics, ranges and degrees of the pollution as well. Therefore, the selection of comprehensive control measures should be combined with regional characteristics and local conditions.

The comprehensive control system is under the overall direction of the regional government organs (because of regional characteristics they may cut across provincial, prefectural and city boundaries), starting from the general plan for economic growth of this region, integrate the development of production, comprehensive utilization of energy and resources, and environmental protection;

regard the section of industry and communication (section of culture, education and health included), the section of municipal administration and the section of sewage receiving waters and farmlands as an integrated system, to arrange overall prevention and control.

Combined with the objective of the struggle of the next 20 years, we divided the comprehensive effluent control system of the regions into three stages, readjustment, improvement and permanent control.

Problems which should gain attention are: 1. Prevention is more important than control. Begin with the reform of technology and the renewal of equipment to enable resources and energy to become products, especially raising the level of comprehensive utilization and re-utilization within industrial and communicational enterprises, within agriculture, animal husbandry and fishery and within the region. This is the most effective way to control pollution. 2. Change the emphasis on "large polluters" to special toxic pollution. We should not adopt natural methods of purification for organic and toxic substances that are difficult to degrade, some heavy metals, radioactive substances that have a long half-life, pathogenic bacteria, virus, etc. To propose "zero discharge" as the objective for the control of these substances from a strategic standpoint is not only technologically rational but also economically feasible. They should be restricted in every link; for example, stop producing products which seriously damage the environment; replace toxic raw materials; expand close-cycle technology; consider treating items which cannot be solved with technology at present individually and in depth; formulate strict regional standards and so forth. 3. Integrate organically the control of industrial and communication enterprises and municipal administration together with the natural purification in section of sewage receiving waters and farmlands. Delimit lots (waters) where it is possible to develop natural purifying facilities in accordance with the regional natural conditions of farmlands and waters. The principal means of natural purification include the dilution and self-purification in oxidating ponds, rivers and lakes and sewage irrigation of farmlands; to calculate the capacity of natural purification we should combine loads, dividing kinds and quantity of pollutants these facilities can handle. If these facilities and conveyance system are given priority to develop and the volume of recycled water used by agriculture is increased, the burden on industrial and communicational enterprises and municipal administration will be lightened. 4. The discharge standards of regional surface water, industrial waste and agricultural irrigation water should be formulated according to local (regional) conditions, pollutants and factories and based on three stages--readjustment, improvement and permanent control. Because of regional differences in natural background, water resources and economic and technical levels, concrete discharge standards should pay particular attention to local conditions. Under the principle of meeting current standards on food hygiene and groundwater, in the near future, standards for some pollutants may be appropriately lowered for surface water, industrial effluent and agricultural irrigation water. The principle of formulating standards according to the plants: to be strict with large plants more lenient to small plants, strict with new plants more lenient to old plants. We should then study ways to perfect discharge standards.

The tentative plans of the readjustment stage includes: objectives of environmental quality, contents of environmental management, to provide measures, approximate deadline for completion, forecast environmental benefits, rationality of the environmental economics and so forth.

Major objectives of quality during the readjustment stage are: to control the expansion of water pollution, put an end to the passive state of treatment unable to catch up with the production of new pollution, and the forecasted environmental results will not cause an increase or expansion of pollution in receiving waters and farmland. Tasks of the readjustment stage can be accomplished in most areas of China during the period of the Sixth 5-Year Plan.

I. Section of Region

The major contents of regional management are to formulate regional environmental plans, and define control policies of the region. Basic measures are:

A. To successfully assess regional environmental quality.

B. Propose rational layout and construction in the region, prevent the transfer of urban plants, which are backward in technology and equipment, severely pollute and discharge toxic substances, to the commune or brigade-run enterprises in rural areas.

C. Calculate the possible impact of pollutants on groundwater, drinking water, soil and crops, and estimate the general controlled volume of each pollutant in line with conditions, such as hydrology, meterology, soil, geological structure, and so forth of the receiving water bodies and farmland.

D. Put forward concrete requirements during the readjustment stage to all sections in the region, and assist and supervise each section to fulfill them in time.

E. Protect forest reserves, and launching mass campaigns for planting trees and afforestation to expand the green areas of the region, and beautify the environment.

II. Section of Industrial and Communication Enterprises (Cultural, Educational and Health Included)

The first thing which should be defined during the readjustment stage is that environmental management of industrial and communicational enterprises is an important component of enterprise management.

Leaders of production units should be responsible for environmental protection, they should also estimate the environmental result while considering production issues such as variety, output, quality, cost, expenditure and so forth, environmental protection work should be regarded as one of the standards in judging the operation of an enterprise.

Providing measures in this section during the readjustment stage are:

A. Separate flows of clean water and sewage, and recycle the use of water. First of all, attention must be paid to the re-utilization of water for air-conditioning, cooling and multiwashing.

B. Strengthen the supervision of present equipment, eliminating leaks and spills.

C. As soon as possible implement recovery and utilization measures which need only small investment and simple and proven techniques.

D. Departments in charge of new, expanded and rebuilt projects must do a good job in forecast evaluation of environmental quality; carefully select sites, consider the environmental impacts on the entire region and integrate regional industrial distribution to benefit comprehensive utilization among plants. Select advanced technology and equipment. The necessary treatment facilities must implement the three simultaneous efforts principle. The control of discharge should be based on the discharge standards of the permanent control stage.

E. Actively plan the technical transformation of old enterprises and emphasize the technical transformation of key enterprises in the region.

F. Make appropriate arrangements to close, suspend, merge or retool enterprises whose distribution are extremely irrational and cause serious pollution.

III. Section of Municipal Administration

The major contents and measures in management of this section are:

A. Formulate plans on the grouping and setting, conveyance and collection of sewage discharged by this section in line with the comprehensive consideration of industrial waste, domestic sewage, precipitation, surface runoff, natural purifying facilities of the region and other factors. Building and readjusting conveying networks rationally, this work should be done during the improvement stage in most areas of China.

B. Regulate the collection of major pollutants inside the region in light of actual conditions, assisting and supervising all units of the industrial and communication enterprise to discharge effluent according to requirements.

C. Actively plan concentrated treatment facilities. These facilities must first take into account primary treatment units,* but should consider the requirements on re-utilization of water in industry during the permanent control stage, some primary treatment units should be developed into secondary treatment units in overall arrangement and technological process. It must be required that the effluent treatment rate should reach 25 percent of the total volume of effluent during the period of the Sixth 5-Year Plan.

IV. The Section Receiving Water Bodies and Farmlands

A. Explore, plan and design new sewage-irrigated areas, expanding the general environmental capacity for natural purification. Standards must be formulated and design parameters must be worked out for projects of sewage irrigation, sewage fish-breeding and so forth, and measures to prevent permeation of conveying pipelines must be considered.

B. Supervise the discharge of other sections, and prevent "special toxic substances" entering this section.

C. In line with the water quality standards for farmland irrigation during the readjustment stage, after removal of toxic substances by simple and easy means, the sewage from food, fermentation and domestic life and industrial effluent from paper-making, printing and dyeing, tannery, plastics, rubber, medicine manufacture, inorganic chemical, chemical fertilizer, glass and ceramics can be used for sewage irrigation.

Alternative measures in this section are:

A. Simple treatment facilities for sewage irrigation and fish-breeding such as oxidation ponds and channels, precipitating tanks and so forth should be built according to local conditions.

B. Expand the sewage irrigated area as much as possible to carry out mixed or rotating irrigation by drawing water from rivers, lakes, and groundwater to reduce the density and quantity of pollutants per unit area.

C. It is necessary to have scientific quotas and techniques for sewage irrigation, lands in sewage-irrigated district must be leveled, applying as much

*According to the analysis of surveys on several scores of sewage treatment plants in China, in a municipal sewage-treatment plant with a daily treatment capacity of 200,000 cubic meters, the operating cost of secondary treatment is 6.25 times higher than primary treatment. Viewed from the general environmental economic results, to compare the disposal rates of pollutants between a primary plant with a daily treatment capacity of 300,000 cubic meters and a secondary plant of the same sizes, the disposal volume of the former is 33 percent that of the latter; the annual comprehensive expenses in basic construction and operation is only 18 percent that of the latter. In other words, to spend the same amount of money, the pollutants disposed by primary treatment are 2 times more than those by secondary treatment.

as possible furrow or border-strip irrigation and rejecting wild-flooding irrigation, and carry them out according to different growth periods of crops and with appropriate volume.

D. Select crops and varieties which are strong in resistance and low in enrichment of toxic substances.

E. Emergency measures must be adopted to farmlands polluted by special toxic substances. For example, stop sewage irrigation, plant with activated sludge, change to planting cash crops, change planting food grain to industrial grain and so forth.

The present effluent volume and the amount of toxic and hazardous substances discharged can be reduced by 25 to 50 percent with the comprehensive treatment during the readjustment stage. The major quality objective and environmental benefits during the improvement stage are: most pollutants will be controlled; contamination of most receiving water bodies and farmlands within the region will be improved. Environmental management during this stage will be improved in line with the reform of the economic management system. The discharge network of the municipal administration section and the primary treatment facilities in most regions will be completed, secondary treatment for key regions will be planned in order to raise the re-utilization of water used in industry. During the improvement stage, natural purification facilities must be perfected energetically, ditches, canals and pipelines should form a complete network; sewage regulated reservoirs will be built and the year-round capacity of sewage utilization in agriculture will be raised. Gradually, sewage will not be used to irrigate vegetables. The environment of sewage-irrigated areas in China will be improved gradually along with the stability and degradation of toxic and hazardous substances in the soil and farmland ecosystem.

In the permanent control stage, an active ecosystem will be established by meeting the requirements of the environment imposed by the ecological factors in every region. Take further steps to protect water sources, building large-scale inter-basin water diversion projects, increasing the dilution capability in the northern regions, developing closed circulation in industrial and mining enterprises, strengthening the concentrated treatment in municipal administration, doing a good job in re-utilization of waste water in industry, agriculture, animal husbandry and fishery, and meet the environmental standards of a clean region.

Most of the quality objectives during the improvement stage will be accomplished by the end of the Eighth 5-Year Plan. By the year 2000 or a bit longer, tasks of the permanent control stage will be completed.

12272
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TEXTILE SYMPOSIUM DISCUSSES EFFLUENT TREATMENT

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 12, 1983
pp 11, 28

[Article by He Jia [4421 0163]: Textile Ministry Convenes Symposium on Effluent Treatment]

[Text] A national symposium on effluent treatment by the textile industry was held in Kunshan County, Jiangsu Province on 13-20 October. Its purpose was to open up a new phase in environmental protection in the textile industry.

The symposium began by summing up the work since the first textile industry symposium on effluent treatment in 1981, and exchanged experiences on management and technology. Symposium delegates believe that the textile industry has made fairly rapid progress in industrial effluent treatment because it has conscientiously complied with the spirit of central directives. Leaders at all levels have also raised our understanding of environmental protection. At the Handan Textile Mill, both the office and factory have put a leading cadre in charge of environmental protection. Special organizations also exist to look after environmental protection.

Moreover, the Mill gives financial assistance to grass-roots units strapped for capital so that they could speed up the installation of anti-pollution equipment. Its Dungfeng Cotton Textile Factory is a collective medium-sized enterprise. Since it makes very little profit, it did not have the capital to build a sewage disposal plant. However, supported by the Handan Textile Mill, and with the director personally in charge, it cleared several channels to raise enough funds to build a treatment facility. In operation for over a year now, the facility has produced good results, enabling effluent to reach nationally prescribed standards. While emphasizing management, the units conducted research on treatment technology with enthusiasm. Much has been achieved in such areas as the biochemical treatment of reactive sludge digestion, contact oxidation, tower filtration, and the physio-chemical treatment of electrolysis, flotation, coagulant precipitation, and ozonization. These achievements continue to be used and popularized in production. The 13 SAT species of bacteria developed by the Shanghai Petrochemical Plant were instrumental in solving the old problem of sulfur, cyanic acid and sodium in the sewage of acrylic fibres. After twice improving on the electrolysis groove, the Wuhan Wool Spinning Mill succeeded in bringing down the amount of electricity consumed in treating a gallon of sewage by 80

percent to 0.2 kwh from 1.01 kwh. The cost of treating a ton of sewage has also been lowered from 0.165 yuan to 0.064 yuan, a drop of 61 percent.

The textile industry is one of the worst polluters in the industrial-communications system. Although a basis already exists for effluent treatment in the industry, the treatment ratio remains a low 26 percent and much remains to be done. In 1983, the nation's textile industry treated 780,000 tons every day. The target for 1985 is 900,000 tons. A 120,000 ton increase in two years is not easy. To achieve this result, we must keep up our knowledge, perfect our environmental protection organizations, strengthen training, improve the professional quality of our environmental protection contingent, strictly enforce the principle of the "three simultaneous efforts", intensify scientific experimentation, and vigorously popularize advanced technologies. The symposium also discussed amending the textile industry's environmental protection plan during the "Sixth 5-Year Plan" period, the "Environmental Protection Management Regulations for the Textile Industry", "Grading and Assessment Methods for Effluent Treatment from Printing and Dyeing", "A Plan for Effluent Treatment from Printing and Dyeing", and "A Plan for Effluent Treatment from Wool Spinning and Dyeing." The symposium also began drafting a plan for the "Seventh 5-Year Plan" period.

The symposium commended the string of locales and units which have performed well in effluent treatment.

12581
CSO: 4008/127

NEW EQUIPMENT HELPS TO CLEAN UP ENVIRONMENT

Hangzhou ZHEJIANG RIBAO in Chinese 6 Sep 83 p 4

[Article by Hu Shuang [5170 7208]: "Advanced Equipment to Protect the Environment and Recover Raw Materials--Jiahuan Brand GJX-5/100 High Voltage Electrostatic Precipitator"]

[Text] Cement plants and phosphate fertilizer plants generate large amounts of powdered dust in the course of production. Discharged through smokestacks, the dust pollutes the environment and is itself a great waste. In order to eliminate pollution, protect the environment and recycle useful materials, China began in the 1960s to manufacture electric precipitators. This product has an efficiency of over 99 percent, small resistance loss, is able to capture extremely fine dust, and can be put to wide use. On the other hand, this product has low voltage and requires large investments (10,000 yuan per square meter), much space and complicated technical requirements. The average enterprise, especially small and medium plants, cannot afford to use it. Is it possible to develop a precipitator that incorporates the advantages mentioned above, avoids its shortcomings and can be afforded by small and medium plants? Yes. This is the GJX-5/100 high voltage electrostatic precipitator developed by the Jinhua Electronic Instruments Plant, which won a 1981 provincial grade-2 award for outstanding scientific and technical achievement.

The Jinhua Electronic Instruments Plant began trial producing this small precipitator in 1978 at the request of users. The plant leadership attached great importance to the project and appointed Comrades Jin Xinlie, Zhou Jianlu, Sheng Fusheng and Fu Fuchang, the plant's technical mainstay, to a team set up specifically for the project. After a year of experiments, the team produced a prototype in 1979. In November the following year the product was evaluated and approved and began to be produced in quantity.

The high-voltage electrostatic precipitator has the following characteristics: it captures a broad range of dust particles (larger than 0.01 micron), takes up little space, is easy to produce, costs less in investment, yields fast profits, has high dust collection efficiency (over 99 percent), and consumes little electricity. It can be used in scattered and localized dust-raising areas in such industries as metallurgy, chemicals, chemical fertilizer, cement, papermaking, grain and edible oil processing, and boiler smokestacks. It is an

important advanced equipment for eliminating pollution, protecting the environment, and developing multipurpose utilization. In May 1979 the Jinhua Cement Plant installed a precipitator to collect the dust discharged from the airpipes of two raw material mills. Operations in the years since have been normal and effective, recovering 8.64 tons of raw materials a day, saving close to 30,000 yuan a year. The Honghu Phosphate Fertilizer Plant in Hubei Province attached a precipitator unit to the exhaust pipes of its air sweep mill. The precipirator sucks up and recycles the phosphate ore powder on the spot. Testing shows that the precipitator can recycle 500-600 tons of phosphate ore powder a year, valued at 30,000-40,000 yuan. Efficiency of dust collection is 98.27 percent.

The power supply device of the precipitator consists of a control box, a reactor, and a high voltage silicon rectifier-transformer. These and the dust-collecting pipes form a complete precipitator unit. The rectifier can transform voltage from 220 volts into 100,000 volts. When the rectifier transmits the high-voltage electricity to electrical discharge wires, the insides of the dust-collecting pipes become intense electrical fields, charging the dust particles with electricity so that they cling to the pipe walls. When a certain amount is collected, the dust will fall into the collection hopper to complete recycling. The precipitator uses such modern technologies as semiconducting components, controlled silicon voltage adjustment and switch circuits, and is equipped with zero-position protection, and primary and secondary overcurrent and overvoltage protection. Operation is easy and safe. No accidents have occurred in the 5 years since trial operation began.

The Jinhua Electronic Instruments Plant has manufactured close to 1,000 precipitators to date, its users totaling over 370 in 27 provinces. The precipitator is now a series product with three different specifications, contributing to the modernization effort. The plant's technical personnel are not resting on their achievements but are working to switch to integrated circuits in order to lower cost, improve quality and achieve even greater economic results, so that the precipitator will play a still bigger role in protecting the environment and recycling materials.

9924
CSO: 4008/40

PLANTS ENCOURAGED TO INSTALL ANTIPOLLUTION EQUIPMENT

Antipollution Equipment Plant Publicized

Lanzhou GANSU RIBAO in Chinese 22 May 83 p 1

[Article by Yang Linglong [2799 0407 7127]: "Business Is Booming at the Lanzhou Environmental Protection Equipment Plant"]

[Text] During economic readjustment, the Lanzhou Environmental Protection Equipment Plant in accordance with the needs of society, made the production of environmental protection equipment its principle product, and strives to supply its customers with environmental protection technology and equipment. It is the only industrial plant in Ganzu to specialize in producing environmental protection equipment.

The predecessor of the Lanzhou Environmental Protection Equipment Plant was the Lanzhou Agricultural Implement Fabrication Plant. In 1979, under conditions in which its responsibilities for farm machinery were reduced, and it was faced with readjustment, the plant carried out market surveys, then promptly adjusted the composition of its product line and the direction of its responsibilities. First, it produced switch boxes, economizers, coal lifting devices, sludge expulsion devices and other boiler peripheral and product lines. This was followed by research and trial production of new products for bringing "smoke, dust, steam, water and noise" under control in a comprehensive manner. Integrating their own designs with importing advanced technology, and using the advanced technology to stimulate designing was one of their important experiences in getting a fast start in retooling to produce environmental protection equipment and in achieving good economic results. In recent years, they have sent people many times to different parts of the country to visit their customers, to understand the market, and to establish contact with scientific research units, planning units and environmental product production units. They kept abreast of trends in the development of new products and new technology, and introduced the technological materials and prototype parts for the 140 hydraulic transmission unit, chain furnace exhaust, both the SG-2 and SG-4 model high efficiency centrifugal dust collectors, the ZCC 1-8 model low resistance dust collectors and other advanced environmental protection equipment. Moreover, they reorganized the plant's original facilities and technology, and very quickly threw themselves into large-scale production. Now, 12 environmental protection products have been developed by this plant. Of them, the SG centrifugal

dust collectors, the ZCC low resistance dust collectors and the feeder style furnace exhaust were entered in the National Environmental Protection Technology and Equipment Exhibition held this spring at Nanjing, and were well received by the specialists who attended.

While the Lanzhou Environmental Protection Equipment Plant strives to raise product quality, it firmly carries out the "three guarantees" on the products that leave the plant, guarantees installation and technological guidance for its customers, and has won the trust of its customers and has expanded its market. In the past few years, they have supplied 3,244 pieces of environmental protection equipment to 25 areas both within and outside the province, and have contributed to protecting the environment and benefiting the people, and have allowed enterprises to exist and develop. Since retooling, the plant's output value and profit have gone up year after year. The output value last year was 2.8 million yuan.

Although the products of the Lanzhou Environmental Protection Equipment Plant have been well received by customers, up to now the products are not included in plans, and the supply of materials is uncertain. Recently, a group of environmental protection specialists and customers who visited the plant said that they felt this kind of specialized plant which produces technical equipment for controlling environmental pollution should have the close attention and support of planning and economic management departments.

Plants Urged to Strengthen Management

Lanzhou GANSU RIBAO in Chinese 22 May 83 p 1

[Commentary: "Be Persistent in Environmental Protection Work"]

[Text] During economic readjustment, the Lanzhou Environmental Protection Equipment Plant retooled, set up quickly and achieved good results. For the past few years, they have supplied several thousand pieces of technical equipment for environmental protection work, which has been well received by their customers. But the products are not listed in plans, and the supply of materials is not assured. Their problems should receive the close attention of concerned departments.

Environmental protection and pollution control play a very important part in reducing the waste of resources and energy, maintaining the ecological balance and protecting human health. In the past few years, Gansu's environmental protection work has been successful, especially in eliminating dust and smoke in the cities, and the results are obvious to everybody. But some visible and audible sources of pollution still have not been brought under control. Lanzhou's air is polluted and water pollution in some areas has not been resolved. Consequently, we must foster thinking for long-term control, and do a good job in a down-to-earth fashion.

In environmental protection, we must combine management with treatment, and use management to promote treatment. Through management, we can block the emissions, drips, and leaks and reduce the sources of pollution. If we want

to bring these things under control, we must use technical equipment. Our province's environmental protection work had a late start, and our present equipment and control work is quite inadequate. We hope that under the close attention and support of planning and economic management departments, scientific research, planning and production departments will give their full cooperation to supply even better quality, and more kinds of environmental protection equipment, and thus enable environmental pollution in a number of areas in Gansu to be brought under control soon.

12452
CSO: 5000/4176

XINJIANG ENVIRONMENTAL PROTECTION MEETING CLOSES

HK120817 Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 11 Apr 84

[Excerpts] The 5-day regional conference on environmental protection successfully concluded this afternoon. It called on the leading departments of the party and government at all levels to grasp environmental protection as a major fundamental policy, to take effective measures to prevent and eliminate environmental pollution and improve ecological conditions, and to create a new situation in the work of environmental protection in the region.

The conference proposed the strategic goals of environmental protection in the region toward the end of the present century. They are: To strive to fundamentaly overcome environmental pollution, to fundamentally resume the benign cycle of natural ecology, and to create a clean, beautiful and tranquil environment for production and life in urban and rural areas, so that the environmental conditions in the region can cope with the development of the national economy and the improvement of the material and spiritual lives of the people of various nationalities. The strategic focus is: With the protection and rational utilization of water resources as the center and scientific and technical progress as the motive force, to amass power to tackle problems of environmental pollution and ecological damage, and to resolutely stop further environmental pollution and ecological damage in the course of exploiting natural resources and building construction projects.

The conference pointed out: Environmental protection involves all economic and social sectors and concerns the immediate interests of all households. Leading cadres at all levels should hold themselves highly responsible for the party and the people and seriously carry out environmental protection work by upholding the principle of combining prevention and elimination of pollution with emphasis on prevention.

The conference also proposed that: From now on, effective measures should be adopted and forces concentrated to solve the problems of pollution of the water of (Shuimu He), water in the Yanqi township section of Kaidu He, and the water of the (Liuguhu) Reservoir, and the serious pollution of air and underground water in Urumqi City. At the same time, vigorous efforts

should be made to improve ecological environment by planting trees and growing grass.

The conference was presided over by Ismail Amat, chairman of the regional government. Zhang Sixue, Song Hanliang, and Tuohuti Shabier each made speeches at the conference.

CSO: 4008/298

JIANGSU'S HAN PEIXIN AT NANJING ENVIRONMENTAL MEETING

OW141455 Nanjing Jiangsu Provincial Service in Mandarin 2300 GMT 13 Apr 84

[Excerpts] According to a XINHUA RIBAO report, the fourth provincial environmental protection meeting sponsored by the provincial people's government has set forth a clear-cut fighting goal. The goal is: By 1990 all old enterprises discharging serious pollutants in the province must be tamed, new pollutant sources must be stemmed and rural environmental pollution brought under control. The meeting was held in Nanjing from 9-13 April. Vice Governor Zhang Xuwu conveyed the guidelines of the second national conference on environmental protection and made a speech at the closing ceremony. The meeting summed up and exchanged experiences gained by a number of areas and departments in carrying out environmental protection work, held an exhibition on the achievements in protecting the environment and heard suggestions on environmental protection by Comrades (Fang Yamin), (Xiong Yi), and (Sun Jiazhi).

The meeting was addressed by Comrades Han Peixin and Gu Xiulian. This province has done a great deal of work in ameliorating pollution and protecting the environment over the past few years, but the task is still arduous.

It is, therefore, necessary to set forth a clear-cut fighting goal that can be attained so that the problem of environmental pollution and ecological destruction can be solved during the course of economic construction.

To ensure the attainment of this fighting goal, the meeting decided to take the following major steps: 1) To do a good job in environmental protection planning; 2) to step up the solution of the old pollution problem and to stem the emergence of new pollutants; 3) to protect the rural environment and ensure an ecological balance; 4) to strengthen scientific management of environmental protection work; and 5) to spell out a sound (?economic) policy for protection of the environment in the interest of obtaining the necessary funds for environmental protection.

CSO: 4008/206

GANSU'S LI ZIQI AT ENVIRONMENTAL CONFERENCE

HK170658 Lanzhou Gansu Provincial Service in Mandarin 1100 GMT 16 Apr 84

[Excerpts] The provincial conference on environmental protection, which concluded this morning, has put forward the strategic goals for protecting the environment of the province in the future, that is, by the end of this century. In addition to developing the national economy, the strategic goals are to basically solve the problem of pollution of the environment in the province, to basically restore the benign ecological cycle, and to build the rural and urban areas of the whole province into a clean, quiet, and beautiful environment for production and existence.

The conference maintained it is necessary to pay close attention to solving the major pollution problems, to speedily control the pollution of the atmosphere above Lanzhou and other cities and towns, to improve the harnessing of the sections of the Huang He and other major rivers within the boundaries of Gansu, to control the noise pollution in the cities and towns, and to resolutely shut down a number of factories which are close to densely populated areas, vacation resorts, and the water source protection zones and whose pollution problems are serious and hard to solve, suspend their operation, amalgamate them with other enterprises, or switch them to the manufacture of other products.

Present at the closing ceremony today were the leading comrades of the province's party committees and people's governments and the responsible persons of the departments concerned. Li Ziqi, secretary of the provincial CPC committee, spoke at the ceremony. He said: To protect the environment is one of our national policies. In making a success of environmental protection, we are the ones to make efforts while the coming generations are the ones to benefit from it. The province has done much to protect the environment and it has made certain achievements. However, we should also see the seriousness of the pollution problems with which we are confronted. It is necessary to pay close attention to environmental protection and to make some achievements each year.

CSO: 4008/206

GUILIN POLLUTION CONTROL NOTED AT ECOLOGY MEETING

OW021305 Beijing XINHUA in English 1220 GMT 2 Apr 84

[Text] Nanning, April 2 (XINHUA)--More cormorants are seen on the picturesque Lijiang River near Guilin, in the Guangxi Zhuang Autonomous Region, following implementation of strict antipollution measures by the city authorities.

Fishing vessels, no longer seen on the river for years, have appeared again and many fishermen still preserve the habit of keeping a cormorant. Yet a few years back, the number of the diving birds kept decreasing as the river water was polluted and the bird often laid soft shelled eggs which could not be brooded.

Speakers at the second annual meeting of the Chinese Society of Ecology which concluded today in the south China resort city said the rise in the local fish and cormorant population was directly attributable to Guilin's environmental programs.

During the past several years, the city government has moved or shut down 38 factories and workshops that were polluting the river. Industrial waste treatment projects were also set up, and polluting industries were fined under tough new regulations.

Three scenic lakes in Guilin have been dredged, and 48 channels discharging polluted waste water into the lakes dammed. A new spillway was also dredged to bring fresh water from the Lijiang River into the lakes, the meeting was told.

A new sewage treatment plant will go into operation this year and another will be finished in 1985 to supplement the one already in operation, delegates said.

Further surveys will be carried out to strengthen environmental protection in the Guilin area, they added.

CSO: 4010/75

QINGHAI CONFERENCE ON ENVIRONMENTAL PROTECTION OPENS

HK030817 Xining Provincial Service in Mandarin 1100 GMT 2 Apr 84

[Excerpts] The second provincial meeting on environmental protection opened in Xining this morning. Vice Provincial Governor Yin Kesheng delivered a speech at the meeting. He called on various localities, all trades, and professions to grasp well environmental protection, and regard this as their pressing obligation.

Those who attended the meeting included Huang Jingbo, secretary of the provincial CPC committee and provincial governor; Zhang Guosheng, chairman of the provincial advisory commission; Song Lin, chairman of the provincial people's congress standing committee; and other responsible comrades of various provincial departments, bureaus and commissions.

In his report, Comrade Yin Kesheng talked about the problems occurring in environmental protection in the province. He said: Having a beautiful living environment and natural environment is an indispensable part in the building of the two civilizations. We should fully understand the importance and necessity of environmental protection work from this strategic high plane of building the two civilizations.

He added: To attain the objective of environmental protection, we should, first of all, do the following two things: 1) We must give play to the superiority of planned economy, and do the work of environmental prediction well. We must put prevention first; 2) We must establish an environmental management system and strengthen management organs. We must adopt various methods to strengthen environmental management.

Comrade Yin Kesheng stressed: To protect the environment, we should rely on laws and regulations, and utilize legal means. In accordance with the spirit of the environmental protection law of the state, various localities and departments must enact their own environmental protection regulations. Environmental departments and judicial departments at various levels must be strict in enforcing the law and punishing those who violate the law.

CSO: 4008/237

GUANGXI ENVIRONMENTAL PROTECTION CONFERENCE ENDS

HK030821 Nanning Guangxi Regional Service in Mandarin 1130 GMT 1 Apr 84

[Excerpts] On 30 and 31 March, the regional people's government held a regional conference in Nanning on environmental protection to convey the spirit of the second national conference on environmental protection, to study the problem of how to create a new situation in our region's environmental protection, and to call on all places to vigorously go into action to prevent pollution, improve ecological conditions, promote the four modernizations, and bring benefit to the people.

Comrade Gan Ku, vice chairman of the regional people's government, presided over the conference. Comrade Wang Rongzhen, vice chairman, and leading comrades of the regional economic committee, the planning committee, the construction committee, and the environmental protection office spoke at the conference.

The conference pointed out that environmental protection is an important national policy of our country. The objective of struggle for our region's environmental protection by the end of this century is to strive to basically solve the problem of the region's environmental pollution, to restore the ecological system which has been sabotaged, to a benign circle, to make all environmental targets reach or approximate to the state standards, and to provide the people in our region with a good environment for urban and rural production and for a livelihood which suits the level of being well-off. To guarantee the fulfillment of this objective and to create a new situation in environmental protection, it is necessary to do all aspects of work in a down-to-earth manner and well. All places must include environmental protection in their plans for the national economy and must insure that the plans for economic construction, urban and rural construction, and environmental construction are simultaneously worked out, carried out, and developed.

The conference stressed that leaders at all levels of the party and government must regard environmental protection work as their own important duty and must grasp it well. They must regularly discuss and inspect environmental protection work and must solve practical problems. In the course of structural reform, environmental protection organs of all places and all departments must be strengthened but must not be weakened. The environmental protection organs which have now been set up must be further reinforced and must do a good job in their ideology, organizations, and work so that environmental protection organs at all levels can bring the role of leaders into play as assistants in environmental management.

CSO: 4008/237

HENAN CONFERENCE ON ENVIRONMENTAL PROTECTION CONCLUDES

HK120837 Zhengzhou Henan Provincial Service in Mandarin 1030 GMT 11 Mar 84

[Excerpts] The first Henan Provincial Conference on Environmental Protection concluded this morning. Provincial Vice Governor Yue Xiaoxia presided over the concluding ceremony, and Governor He Zhukang delivered the concluding speech.

In his speech, after making a correct assessment of the status quo in environmental protection work, Governor He Zhukang pointed out that doing a good job of environmental protection is a basic national policy in realizing the great target put forth by the 12th CPC National Congress. We must approach this question from such a high plane. Along with the development of the reform of the economic system and the rapid development of industrial and agricultural production, a new situation and some new problems have appeared in the environmental protection work. Therefore, it is necessary to adopt effective measures and policies to solve these problems. The general targets of environmental protection work in this province are: To prevent the occurrence of new pollution by implementing strict measures so that the environment of the whole province can be improved to a certain extent by 1990 and a foundation can be laid for the overall environmental construction in the last 10 years of this century, and to strive for a basic solution to the problem of environmental pollution by the end of this century so that the production and living environment in both cities and countryside can become clean, refreshing, and quiet and so that the environmental situation of the whole province will be basically suited to the development of the national economy and the improvement of the people's material and cultural life.

Comrade Liu Jie, first secretary of the provincial CPC committee, attended the conference and spoke. He called on leading cadres at various levels and the masses of people to conscientiously implement the spirit of this conference, to overcome difficulties, and to courageously carry out the reform, so as to create a new situation in this province's environmental protection work.

CSO: 4008/237

BEIJING ANNOUNCES POLLUTION CONTROL PLAN

OW171213 Beijing XINHUA in English 1059 GMT 16 Mar 84

[Text] Beijing, March 16 (XINHUA)--Beijing plans to complete 12 projects in pollution control, environmental protection and urban landscaping this year, Vice Mayor Zhang Baifa announced at a working conference on environmental protection now in session here.

These include modification of the 209 old-fashioned boilers in the city proper and of some kilns and mobile boilers, and the building of three smokeless zones including the Xiangshan hill beauty spot in the western suburbs, a densely populated urban area and another city area.

In residential, commercial and administrative centers, the municipality recommends central heating to reduce chimneys, greater use of gas and honeycomb briquettes instead of egg-shaped briquettes, and the improving of household stoves. The pipeline for natural gas from the North China oilfield in Hebei Province is expected to be completed this year.

The vice mayor listed measures to protect water resources. The Miyun, Guanting and Huairou reservoirs that supply water to the Chinese capital must be kept clean; rivers must be dredged; river banks must be planted with trees; factories and hospitals along rivers are required to treat waste water, sewage and other harmful substances. Those who continue to discharge waste into rivers will be penalized by economic or administrative measures or according to law.

More waste water from the chemical, petrochemical, pharmaceutical, textile, paper-making and metallurgical industries and from hospitals should be treated. Public health departments should prepare plans for treating sludge and rubbish discharged by hospitals.

Fifty-two factories will be moved or closed down, including a chemical fertilizer plant and an enamel factory in the urban area and a cement plant, a quarry and a coal pit near Zhoukoudian which are harmful to the Peking [as received] man site there.

Rural industrial enterprises are also required to control pollution and deterioration of the natural ecology and agricultural environment. Another task is to reduce noise. The Chinese capital will also try harder to protect animals, birds and plants, said Zhang Baifa.

CSO: 4010/75

BEIJING DUST POLLUTION, CONTROL MEASURES ANALYZED

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 5, 1983 pp 14-16

[Article by Lu Dinghuang [7120 7844 3521]: "Wind-borne Dust Pollution in Beijing and Measures To Counter It"]

[Text] In order to realize the grand objective, proposed by the CPC Central Secretariat, of "changing Beijing into a first-rate city with the nation's cleanest, most hygienic and most beautiful environment," the study of the pattern of Beijing's wind-borne dust pollution and the development of practical and effective measures to deal with that pollution is an urgent and difficult task.

1. General Description Of Wind-borne Dust Pollution In Beijing

According to data for 1951-1980, Beijing has on the average 33 windy and dusty days every year, or about 1 day in every 11. Dust borne into the air by the wind accounts for one-third of the total amount of floating dust in the Beijing area, which amount is more than three times higher than the world average. Therefore, Beijing's wind-borne dust is a natural form of pollution which cannot be overlooked.

In early history, Beijing and north China had dense forests, green hills, clear waters and clean air. Long-term feudal rule, perpetual warfare and excessive human economic activity destroyed the fragile ecological balance. This led to the deterioration of the environment and the continual worsening of environmental and climatic conditions. On the eve of Liberation, the number of trees in Beijing had been reduced to their lowest level. According to a general investigation conducted by the Beijing Bureau of Parks in 1949, there were only 64,000 trees in Beijing and its suburbs. Therefore, wind-borne dust pollution became more and more serious, especially during spring. In the 1950's, there were on the average about 30 windy and dusty days every spring, that is, 1 day out of every 3. In the spring of 1954, there were actually 49 windy and dusty days, an average of 1 out of every 2 days.

In Beijing, spring has the largest number of windy and dusty days, accounting on the average for 52 percent of the annual total, which is about 5 times

higher than the rates for summer and autumn. Winter also has relatively more windy and dusty days, accounting for 31 percent of the annual total, which rate is about 3 times higher than those of summer and autumn. Spring and winter together account for more than 80 percent of the total annual number of windy and dusty days.

Judging from the changes in spring dust storms over the years, the 1950s were the most serious, with an average of 1 windy and dusty day every 3 days; there was a big decrease in the 1960s, with an average of 1 windy and dusty day every 10 days; the 1970s experienced an increase, with the rate reaching 1 day per week. Due to wind-borne dust, Beijing has a ground-level visibility rate of 1 to 10 km 65 percent of the time and of less than 1 km about 8 percent of the time; high-altitude visibility is seriously affected 25 percent of the time.

Beijing's wind-borne dust has a definite impact on aviation and transportation. Agricultural and forestry production also suffers losses, because wind-borne dust hinders normal photosynthesis. Dust pollution also causes increases in respiratory disease. According to a survey conducted by the Beijing Medical College in 1974, 17.4 percent of residents over 30 years of age in non-industrial polluted areas suffered from chronic rhinitis and chronic pharyngitis. In areas seriously polluted by floating dust and sulfur dioxide, that percentage reached 67.4, and children were especially susceptible. In springtime, when flowers bloom, the sky is filled with dust. This greatly disappoints tourists and causes the tourist industry great loss. And the influence on the climate and weather caused by the increase in dissolved pollutants in the atmosphere is still difficult to estimate at this time.

2. The Cause Of Wind-borne Dust In Beijing

Wind-borne dust is a year-round climatic phenomenon in Beijing. It is a regional climatic peculiarity caused by the long-term impact of the sun's radiation, atmospheric circulation and ground cover.

Beijing is located on the east coast of the Euro-Asian land mass. Beijing is only about 150 km from Bo Hai. Yet Bo Hai is encircled by the Shandong and Liaodong Peninsulas, and thus forms an inland sea. And throughout the year, Beijing's air currents come mainly from the northwest. Therefore, the ocean does not greatly affect Beijing's climate, while continental climate instead is very prominent.

Beijing's climate is the typical temperate, continental monsoon climate. In the winter, Siberia and Mongolia are dominated by high pressure, with prevailing northwest winds. These winter monsoon winds begin to dominate Beijing in October, and continue to do so until March of the following year. The cold, dry air coming from the northwest inland desert areas often passes Mongolia on its way south, and Beijing is the first area to be affected. Therefore, Beijing's winter weather is clear, cold and dry and has little rain or snow but relatively strong wind. In spring, because of the sun's northward movement, the ground surface heats up rapidly; and

because there is low humidity, there are hardly any clouds. In spring, the the temperature rises, and the Mongolian high pressure gradually retreats toward the northwest and diminishes. At this time, although Beijing is still influenced by winter monsoon winds, yet the stability of these winds lessens daily, and the north and south air currents surge alternately. The wind speed increases greatly, and the number of windy days increases. Winter and spring have the greatest average wind speeds and the largest number of days with gales over Force 8; about 70 percent of the gales over Force 8 occur during these two seasons. According to statistics, spring accounts for 40 percent of the annual number of days having Force 6 and Force 7 winds. Based on data for the years 1954-1970, Beijing's springs had an average of 25 days per month in which wind speeds reached 5 meters or more per second. This provides an effective force for the development of wind-borne dust in the spring and winter.

In Beijing, spring and winter also have the lowest precipitation and the least number of days with precipitation. Spring and winter, on the average, account for only 11.6 percent of total annual precipitation, and the number of successive days with no precipitation can be as long as 81 during these 2 seasons. Because of the rapid rise in temperature, relative humidity reaches its lowest level of the year, 0 percent, which occurs during both seasons. Precipitation cannot offset evaporation, and this causes the upper soil layer to become rapidly and extremely dry. At the same time, winter and spring are usually the time when large fields lie fallow or when sowing has just begun. Vegetation cover is minimal, and the dry and loose surface soil provides a large source of material for dust storms.

Therefore, when cold air surges southward, it is often accompanied by strong winds and serious dust storms. In Beijing, there may be as many as 5 days a month in which there are sand and dust storms and ground-level visibility of less than 1 km, while there may be as many as 16 days a month in which wind-borne dust reduces ground-level visibility to less than 10 km.

Most wind which blows up dust is above Force 5, and in a small number of cases (about 5 percent), Force 3 is enough to blow up dust. When wind speed reaches 4.7 meters per second, dust will be blown up.

Precipitation has a good restraining effect on wind-borne dust. Even 0.1 mm of precipitation can prevent the formation of wind-borne dust within 1 to 2 days.

3. The Origin Of Beijing's Wind-borne Dust

The origin of Beijing's wind-borne dust has long been a controversial question. The traditional view is that the dust originates in the arid desert areas of the northwest and Inner Mogolia or in the high loess plateau. Therefore, some interpretations claim that "the wind-borne dust is pressing close to Beijing" and that the "Beijing area faces the serious threat of being turned into a desert."

Scientific and technical personnel of the Atmospheric Physics Institute of the Chinese Academy of Sciences, through analysis of atmospheric soil in Beijing dust storms, discovered that the elements tantalum and europium were not indigenous to the Beijing area and proved for the first time that Beijing's dust storms contain sand and soil particles originating upstream. Then, does all Beijing's wind-borne dust originate in the northwest?

Analysis--based on data on spring dust storms in northern Hebei, Beijing and suburban counties between 1961 and 1970 and on data regarding wind-direction frequencies during Beijing's windy and dusty days between 1957 and 1970--shows that the geographical distribution of Beijing's spring dust storms and wind-borne dust was not consistent. Moreover, comparing data for the urban area with those of suburban county stations, which stations were often only several 10s of km distant: there were great differences in the number of windy and dusty days. This proves that Beijing's dust storms and wind-borne dust are regional climatic phenomena and that the main origin of the dust is the Beijing area itself.

Through a day-by-day investigation of 100 occurences of floating dust in the springs of 1957-1980, it was discovered that 44 of these occurrences gradually moved in from upstream areas. These occurrences were often of larger scope and consisted of dust blown up by the wind in the arid areas of the northwest and then brought in by high-altitude air currents. The other 56 occurrences consisted of dust first blown up by local storms.

Therefore, the source of Beijing's wind-borne dust is mainly the Beijing area itself. 87 percent of all windy and dusty days in the spring are caused by local dust, while 13 percent are caused by dust originating in the arid deserts of the northwest or the high loess plateau. This result, which is obtained through statistical methods alone, has to be investigated and studied further on a broader scale and include chemical analysis of dust samples.

4. Afforestation Is an Effective Means of Controlling Wind-borne Dust in Beijing

An investigation of the changes in Beijing's green-land area and of the pattern of changes in Beijing's wind-borne dust over the years shows that there is a very obvious correlation between the two. Before Liberation, the green-land area was less than 500 hectares, and the actual number of trees was only 64,000. Therefore, in the early post-Liberation period, wind-borne dust was especially serious. After vigorous afforestation, the green-land area rapidly expanded, reaching 2,500 hectares by the beginning of the 1960s. The actual number of trees also increased greatly, reaching over 13 million. Therefore, in the period 1961-1970, Beijing's spring wind-borne dust markedly decreased. During the 10 years of turmoil, green lands and trees were often destroyed, and green lands were reduced by 11 percent, trees by over 40 percent. Therefore, in the last 10 years, Beijing's spring wind-borne dust began to increase, averaging over four occurrences every month and one windy and dusty day every week.

During the 1950s, when Beijing's green-land area and tree population increased greatly, the number of windy and dusty days showed a marked decline. Sometimes there was a slight gap, indicating that afforestation does not bring instant results and benefits and that one has to wait until trees take hold and start to grow after several years before they can restrain wind-borne dust. From the 1960s to the early 1970s, the number of windy and dusty spring days did not show any great upward or downward movement, forming a marked low ebb period. This was due to the large-scale afforestation of the 1950s. The decrease in green lands and the tree population during the late 1960s and the early 1970s caused an increase in Beijing's wind-borne dust in the 1970s, and it ia estimated that this trend will appear again in the 1980s.

Are climatic factors responsible, then, for any of the changes in wind-borne dust over the years? First, let us look at the activity of cold air. Between 1951 and 1960, Beijing was visited by cold-air masses an average of 15.8 times every year. Between 1961 and 1970, the average was 15.5 times a year. The difference between the two periods is not great. Therefore, the great decrease in the number of windy and dusty spring days in the 1960s was not caused by a marked decline in cold-air activity during the same period. Next, let us investigate precipitation. The average amount of spring precipitation between 1951 and 1960 was 66.2 mm and between 1961 and 1970, 67.2 mm, an average difference of only 1 mm. As for the number of days with precipitation, (amounts greater or equal to 0.1 mm) between 1951 and 1960 the annual spring average was 15.5, and between 1961 and 1970 that average was 15.0. The first decade had more such days than the second decade. Yet it can be seen that the reason for the sharp decrease in wind-borne dust during the 1960s also does not lie in precipitation. Therefore, the reason that Beijing's spring wind-borne dust was frequent in the 1950s, decreased greatly in the 1960s and increased again in the 1970s does not lie in climate. These changes are not due to some abnormalities in climate but are the result of increases and decreases in green land over the years.

Summing up the above, Beijing's wind-borne dust pollution is serious and is caused by such factors as high wind speed, the large number of windy days, low precipitation and humidity, and the lack of vegetation cover during spring and winter. Vigorous afforestation and expansion of the afforested area in the city and its suburbs and acceleration of afforestation in the capital is the correct and effective way to stop Beijing's wind-borne dust. The ratio of green ground cover in Beijing has reached 22 percent, and if we can double this rate, we can basically prevent wind-borne dust. 85 percent of this dust originates locally. Therefore, we should constantly pay attention to cleaning up sand and dust on the ground and to controlling blowing sand and dust in construction sites. We must constantly carry out patriotic health movements to clean up and remove dust. We should also conscientiously pay attention to protecting trees and natural grass cover. In order to prevent floating dust from the northwest from invading Beijing, we must accelerate construction of the "three north" protective forest system, which thereby assumes even greater significance.

12380
CSO: 5000/4177

TIANJIN STRESSES POLLUTION CONTROL MEASURES

OW281905 Beijing XINHUA in English 1457 GMT 28 Apr 84

[Text] Tianjin, April 28 (XINHUA)--China's largest waste water treatment plant went into operation here today as part of Tianjin's effort to control pollution.

The Jizhuangzi Plant is capable of treating 260,000 tons of waste water daily, 25 percent of the city's total. Composed of 50 facilities, it turns waste water into clean water for irrigation and sludge into fertilizers containing nitrogen and phosphorus. The methane gas produced in the process of treating sludge is used to generate electricity.

"The plant will be expanded to treat 350,000 tons daily and another plant will be built to treat 400,000 tons a day," said a spokesman for the municipal environmental protection bureau.

"On completion of the projects, over 70 percent of Tianjin's waste water will be treated," he said.

Oxidizing facilities will also be installed on a reservoir capable of storing 5.6 million cubic meters of waste water in Hangu District to improve its treating capacity.

A gasworks will go into operation late this year to supply 280,000 cubic meters daily to 100,000 families, the spokesman said. Work will begin this year on another gasworks providing 600,000 cubic meters each day. A third gasworks is also planned.

"Gas will be available for most urban residents and some small and medium-sized factories following completion of the three gasworks," the spokesman said. "As a result, one million coal stoves and several thousand boilers will be discarded in urban areas.

The Tianjin No 1 power plant, which discharges 13 percent of the city's coal dust, will be renovated to supply both electricity and heat.

Other anti-pollution measures planned include utilizing coal ash and steel slag, cleaning up a polluted river running through the city and moving 140 factories out of urban areas.

CSO: 4010/83

SURVEY SHOWS TIANJIN MUNICIPALITY SUBSIDING

OW180248 Beijing XINHUA in English 1241 GMT 17 Mar 84

[Text] Tianjin, March 17 (XINHUA)--Scientists here have found that Tianjin is subsiding at a maximum speed of 18.8 centimeters per year, according to a 5-day symposium on the 1-year survey of the coastal zone of the municipality that ended here today.

The subsidence is caused by irrational utilization of underground water in the past dozen years, the scientists explained. They called for restraint in extraction of underground water and pumping back of surface water.

Tianjin has been suffering from water shortage for years. A project for diverting the water from the Luanhe River in Hebei Province has been completed and the water is expected to reach the Tanggu District of the municipality at the end of this year.

During the coastal survey, the scientists also found that the earthquake intensity increases from south to north along the coastal zone of Tianjin. Since the zone is a major site for future development of the municipality, the scientists proposed that major projects should be located not in the north of the city but in the middle and south.

The coastal survey also provided abundant data on natural conditions and resources in the coastal zone of the city thus paving the way for the development of salt production, breeding of aquatic products, petroleum extraction and construction of water conservancy schemes, harbors and industrial enterprises, the scientists said.

CSO: 4010/75

EFFORTS TO CLEAN UP ENVIRONMENT IN TIANJIN

Tianjin TIANJIN RIBAO in Chinese 25 Jul 83 p 3

[Article by Meng Jihua [1322 4949 5478]: "Leading Cadre of the Environmental Protection Bureau Talks on Environmental Protection"]

[Text] Clear water, green trees, fragrant flowers and chirping birds--these are the original features of nature. Who does not want to live in such a refreshing and comfortable environment? However, along with the rapid development of modern industrial production and the irrational exploitation and utilization of natural resources, a series of changes have taken place in the natural environment. The ecological balance has been destroyed, and the environment has been polluted to varying degrees. If we want to ensure the proliferation of various resources required for the four modernizations and protect the environment from pollution, how will this contradiction be resolved?

This correspondent interviewed a leading cadre of the municipal environmental protection bureau with this problem in mind.

This cadre said: Pollution is man-made, and it is entirely possible for people to bring it under control with scientific means. She recently returned from an investigation tour abroad, and personally witnessed how some industrially developed countries had extricated themselves from the serious environmental pollution of the 1960's by devoting attention to environmental protection, adapting strong measures and were just entering the stage of emphasizing both prevention and treatment with greater emphasis on the former. These countries have achieved fairly remarkable success in environmental protection as a result. She said: China is a socialist country, which treats people's interests as a matter of first importance. As long as people at all levels understand the importance of environmental protection, more suitable measures will be implemented. She told us how Tianjin Municipality introduced a series of policies and statutes on environmental protection based on state general and specific policies. This shows that our environmental protection work has made a good start.

She thought for a while and said: The 1980's are a crucial period in our socialist modernization construction which requires abundant natural resources and a good natural environment; therefore we should combine economic development with environmental protection, ensure the rational exploitation and utilization

of natural resources during the modernization drive, transform the natural environment in a scientific way, prevent pollution and ecological damage. However, since environmental protection is a new science developed in the 1970's, many people still do not understand it or recognize its importance, therefore, there are many obstacles in developing this line of work. She told me that at present the major obstacle is: At the very mention of environmental protection, people can only think of investments and expenditures, and then evade or abandon any project. She said: In fact, environmental protection itself can generate value. To be more specific, the even greater significance is that it can help recover energy and resources. In this sense, it generates value and protects productive forces. She knew that I did not understand, and cited some examples to illustrate her point. In 1982, 12 million yuan was allocated for controlling 120 sources of environmental pollution. What were the results of this investment? She mentioned the following figures: Each year, we treated more than 18.8 million tons of industrial waste water, 307 million cubic meters of industrial waste gas, more than 200,000 tons of industrial residue, and more than 700 tons of particulate matter. At the same time, we saved more than 490,000 tons of water and recovered more than 39.2 million of various materials for the state. The direct benefits obtained amounted to 4.98 million yuan. In other words, the entire investment could be recovered in about 2 1/2 years, and thereafter would generate value for the state. When there is a shortage of water and other resources, this recovery is highly significant. She also spoke about the central heating station in Tanggu District. An investment of 3.47 million yuan was required to build this station. However, after being put into operation, this station could replace 108 boilers, and help save 8,586 tons of coal, a value of 300,000 yuan and 980,000 kWh of electricity, a value of more than 90,000 yuan, each heating season. The number of boiler workers was reduced by 156, and 7,000 square meters of land were saved. This great economic value far exceeded the investment. Even more gratifying is that the amount of smoke and dust discharged was reduced by 82.6 percent, virtually eliminating particulate matter in the area. Is this not enough to show the lucrative side of environmental protection?

The leading cadre said: Our objective is to quadruple the gross value of industrial and agriculture output, this means that the input of energy and resources have to be increased as well. If we are only concerned with exploiting new resources and pay no attention to the recovery of discarded energy and other resources through environmental protection, this is not only a great waste but also will disrupt the ecological balance and affect the reproductive power of energy and other resources. This is a crime against future generations. She said: Our four modernization drive is now beginning, but it is not too late to include the work of environmental protection in our agenda, adopt forceful measures and carry out the work in a down-to-earth manner. If we fail to take this matter seriously or to adopt forceful measures, we will not be able to remedy the damage done in the next 1 or 2 decades. This is by no means alarmist talk; this problem is just like that of population. Since we failed to take the problem of population seriously in the 1950's, this problem became serious 30 years later. Environmental protection, in essence, is meant to protect people's health, to develop social production and benefit future generations.

9411
CSO: 4008/209

HUBEI STRIVES TO IMPLEMENT PRC POLICY ON ENVIRONMENTAL PROTECTION

HK131007 Wuhan Hubei Provincial Service in Mandarin 1100 GMT 10 Mar 84

[Station commentary: "Strive To Implement the Basic National Policy of Environmental Protection"]

[Text] Since the first provincial conference on environmental protection in 1973, the province has made great headway in environmental protection work. Many comrades have understood the seriousness of the environmental problems and the importance of environmental protection. However, comrades in some departments and enterprises do not have a thorough understanding of the significance of environmental protection. They do not attach great importance to the work in economic construction. As a result, the ecological environment in many localities has been damaged. At present the province's treatment rate and utilization rate of industrial and domestic waste water, waste gas, and waste residue are very low. Problems of polluted rivers and lakes, soil erosion, and reductions in lake area are relatively serious, environmental problems have already become an important issue in the province.

The natural environment is a basic condition on which mankind's existence relies. It is also a basic condition for the development of the economy and society. Leading comrades of the central authorities have pointed out: Once our policy is on the right track, we can pin hopes on quadrupling the gross industrial and agricultural output value by the turn of the century. However, if we do not pay attention to environmental protection work, the level of pollution will also quadruple. Thus we shall be unable to achieve the goal of being comparatively well-off, as put forward by Comrade Deng Xiaoping. It will be very difficult for us to repent and begin the work again. Therefore, we must envisage the environmental problems in the same way as we did the population problems of the 1950's. If we still do not pay attention to the problems and fail to grasp the work of environmental protection well, the environmental pollution situation and ecological damage will become a hard nut to crack by the turn of the century, just as the population problems are at present. We must by no means destroy our homeland or our conditions for existence, harm our younger generations, or commit other foolish acts.

At present, our country regards the environmental protection work as a strategic task and the basic national policy. Our country also includes in its Constitution the work of improving the living and ecological environment,

of preventing pollution, and of preventing other kinds of environmental pollution. This fully shows the importance of environmental protection. We hope that the leading comrades at all levels throughout the province will attach great importance to the work of environmental protection, and really include in their agenda the party and state principle, policies, and measures on environmental protection. We also hope that they will fulfill the work requested for each practical task.

CSO: 4008/237

SICHUAN SUCCESSES IN ENVIRONMENTAL PROTECTION HAILED

OW030844 Beijing XINHUA in English 0806 GMT 3 Mar 84

[Text] Chengdu, March 3 (XINHUA)--A total of 460 million yuan (about 230 million U.S. dollars) has been invested in over 5,600 environmental protection projects in the past eight years in Sichuan Province, the most populous in China.

Speaking at the second provincial conference on environmental protection, Gu Jinchi, vice-governor of the province, said that the design, construction and operation of industrial waste treatment projects have gone hand in hand with the design, construction and operation of over 80 percent of the new enterprises in the province. Projects to utilize industrial waste built during the past two years alone have turned out a total output value of 170 million yuan (about 85 million U.S. dollars), and made profits of over 41 million yuan (about 20.5 million U.S. dollars), Gu said.

One hundred and sixty-four environmental protection undertakings and twenty-two monitoring stations and research institutes have been set up in the province since 1974.

The province, according to the vice-governor, attaches great importance to the role of technical transformation in controlling pollution.

Zigong City, a major salt producer, for example, invested over 50 million yuan (about 25 million U.S. dollars) in building five multiple-effect vacuum salt processing centers to replace the traditional open-pan process, thus efficiently reducing the water pollution caused by salt.

CSO: 4010/75

SICHUAN STEEL CENTER COMBATS POLLUTION

OW081253 Beijing XINHUA in English 1204 GMT 8 Mar 84

[Text] Chengdu, March 8 (XINHUA)--Strict environmental protection laws have helped clean up Dukou City, a rising iron and steel center in Sichuan Province, southwest China.

Dukou, which now has a population of 340,000, began expanding in 1965 when large deposits of coal and minerals including iron, vanadium and titanium were found near the Jinsha River flowing Sichuan and Yunnan. Toxic wastes from its 70 large factories were dumped into the river, while untreated emissions from smokestacks cast a haze over the city until tough antipollution measures were adopted in 1976.

Since then, over 160 environmental protection projects have all but eliminated mercury, cyanogen and phenol effluents from the Jinsha River, and Dukou's nine waterworks have all met state drinking-water standards.

The Panzhihua Iron and Steel Company also installed new equipment costing 40 million yuan (about 20 million U.S. dollars) to treat 62 million cubic meters of waste gas and 170,000 tons of polluted water each day. The move, together with expanded municipal gas networks which eliminated coal stoves from 40 percent of Dukou's households, helped bring sulphur dioxide and nitrogen oxide emissions well within national limits.

The clean-up program was based on research by over 100 academics and specialists working in institutes and colleges throughout China. Dukou also planted 3.5 million trees and built lawns and parks over 21 percent of its area to improve local environmental conditions.

CSO: 4010/75

SICHUAN STEPS UP EFFORTS TO CLEAN ENVIRONMENT

Mining District Hailed

Chengdu SICHUAN RIBAO in Chinese 31 Oct 83 p 2

[Article: "The Southwest Sichuan Mining District Becomes a Clean Mining Area--Strive to Achieve Synchronous Development of Production, Construction and Environmental Protection"]

[Text] Controlling pollution through technical transformation and by establishing a fairly complete environmental management system, the Southwest Sichuan Mining District of the Sichuan Petroleum Management Bureau has basically resolved major environmental pollution problems, with obvious improvements in economic results and socio-environmental benefits, and has been named a "clean mining district" by the provincial Petroleum Management Bureau.

This mining district is a comprehensive enterprise which explores for and develops petroleum and natural gas and carries out production. It is scattered through 14 cities and counties of southwest Sichuan. In the past, pollution from the "three wastes" in the mining district was severe, which not only led to conflicts between industry and agriculture, but also led to continually increasing compensation costs, which reached more than 114,000 yuan in 1979. For this reason, the leadership of the mining district decided to conscientiously resolve problems of pollution from the "three wastes" and achieve synchronous development of production, construction and environmental protection. They made 37 investigations to clarify the five major pollution sources and formulated a comprehensive control plan on this basis. Through technical transformation they gradually completed in a planned way such key protection projects as comprehensive utilization of desulphurized gas and water from the gas field, coagulation of coal powder and waste water from drilling, etc. The utilization rate of recovered natural resources and energy was continually raised. The waste gas from the two desulphurization factories in the Weiyuan gas field which used to be discharged and polluted a 450 square kilometer region nearby to different degrees has now had equipment for dealing with the waste gas installed. This not only solved atmospheric pollution but also provides 700 tons of recovered sulphur annually with a value of more than 280,000 yuan.

While controlling pollution, they also strengthened environmental management and brought environmental protection work into enterprise management. Now, for example, all systems, evaluation norms, etc., have an environmental protection content, and have been implemented in economic responsibility systems, so that the formerly isolated environmental pollution management has now become comprehensive environmental management with the goals of improving economic results and environmental benefits. In the norms for responsibility for costs of a single well for drilling teams, it was stipulated that the rate of meeting specifications for dealing with the "three wastes" must reach 100 percent. If compensation for pollution or a major pollution accident occurs, there will be a deduction from the bonuses or even punishment according to the circumstances. Material rewards will be given to advanced units or individuals for environmental protection work. They also resolutely implemented the decision on the "three simultaneous efforts" so that every stage in the establishment of a new well from design, construction and operation must include equipment for environmental protection. Finally, there is on-the-spot examination and acceptance. This has basically controlled the production of new pollution.

As a result of receiving attention from leaders and the efforts of the broad masses of employees, the current water treatment rate of this gas field has reached 90 percent, the waste water treatment rate and the treatment rate for desulphurized gas in the wells have reached 100 percent, and the value of output from comprehensive utilization of the "three wastes" has reached more than 2.2 million yuan. In a recent meeting to exchange experience on preventing industrial pollution called by key enterprises throughout the province, their changes attracted the interest of the participants who indicated that they wanted to study their experiences and make further progress in work for controlling industrial pollution.

Stronger Management, Leadership Urged

Chengdu SICHUAN RIBAO in Chinese 31 Oct 83 p 2

[Commentary: "Protect the Environment, Control Pollution Permanently"]

[Text] From the past situation of severe pollution, continual disputes and paying compensation every year, the Sichuan Southwest Mining District has leapt into the ranks of "clean mining districts," which is an extraordinary change. It can be seen from their experiences that problems of environmental pollution can be resolved and that it is not necessary to take a long time. The key is to pay attention through continual control as well as strengthening management.

Some successes have now been attained in controlling industrial pollution in our province and a group of enterprises with sophisticated production have appeared. It is a grim reality, however, that Sichuan has severe industrial pollution and that the natural ecological environment has been seriously damaged. Noise pollution in most of the cities in Sichuan exceeds state standards. The time has come when full control of pollution of the environment is unavoidable!

Leadership at all levels should have a sense of mission and urgency for environmental protection. Environmental protection is not simply the control of pollution, but is also an important component of building spiritual and material civilization, as well as an enterprise for safeguarding the basic existence of mankind and creating wealth for our grandchildren and thousands of generations to come. It absolutely cannot be treated as something unimportant. We must resolutely strengthen leadership like the Sichuan Southwest Mining District, make thorough investigations and studies, formulate plans for comprehensive control and investigate their implementation to the end. In prevention of industrial pollution, enterprises must change "wastes" into value through technical transformation, technical reform and upgrading equipment, and make the greatest efforts to increase the rate of comprehensive utilization of natural resources and energy. Projects for new construction, expansion or reform must make good arrangements for preventing pollution throughout design, construction and putting them into operation. The lessons of many enterprises have proven that poor management is one of the major reasons for creating serious pollution. All areas and all enterprises should summarize the special characteristics of their production and bring environmental protection work into enterprise management, to use management to promote control, integrate management and control, and achieve simultaneous improvements in economic results and environmental benefits. In this way, even more enterprises with sophisticated production will spring forth like new sprouts after a rain, and a new situation in environmental protection work can be created.

12539
CSO: 4008/84

HEILONGJIANG SETS ENVIRONMENTAL PROTECTION GOALS

SK280312 Harbin Heilongjiang Provincial Service in Mandarin 1000 GMT 27 Feb 84

[Text] The third provincial environmental protection conference, which concluded today, pointed out that it is necessary to establish in the whole society a fine general mood in which everyone shows concern for, attaches importance to, and protects the environment, to regard environmental protection as a basic national policy and attend to it, and to create a new situation in environmental protection.

This provincial government-sponsored conference defined preliminary short- and long-term goals for the province's environmental protection work in line with the actual conditions in our province. They are: to control the pollution of the Songhua Jiang and its tributaries and the pollution of such key cities as Harbin, Qiqihar, Mudanjiang, and Jiamusi by 1990 and to achieve remarkable improvement in the environment; to comprehensively embark on environmental construction in the 10 years after 1990 so as to gradually restore the province's fine natural ecology and make its environment clean and beautiful.

In order to attain these goals, the conference urged: Leading persons at all levels should deeply understand the basic national policy of environmental protection and attend to it as they do family planning. Environmental protection should be included in the national economic development plan so that economic construction, urban and rural construction, and environmental construction can be planned, implemented and developed abreast, and that economic, social, and environmental effects can be unified. It is necessary to regard the protection of natural resources and ecological balance as an important task for environmental protection work, strictly supervise and conscientiously implement it, raise the standard of environmental control, and rely on scientific progress to make environmental protection a success. Leadership over the environmental protection work should be conscientiously strengthened, responsibilities clearly defined, and organs improved.

At the conference, a decision of the provincial people's government on commending the units and individuals who distinguished themselves in the environmental protection work was announced. Governor Chen Lei and other leading comrades issued certificates of merit and prizes to 24 advanced units and 29 advanced individuals.

CSO: 4008/237

ENVIRONMENTAL PROTECTION DEVELOPMENTS IN HEBEI

Shijiazhuang HEBEI RIBAO in Chinese 13 Jan 84 p 1

[Article by Zhao Xiuyan [6392 4423 1484]: Environmental Protection Flourishes in Hebei]

[Text] After ten years of hard work since the First National Conference on Environmental Protection in 1973, Hebei Province has established a preliminary three-tier (provincial-municipal-county) environmental protection system. The system has more than 20 monitoring stations, 1,400 environmental management, research and monitoring personnel, and 760 major instruments and equipment. The main sources of environmental pollution are plants and mines. Over the past ten years, Hebei has investigated, monitored, and documented 670 cases of pollution from plants and mines. Building on this foundation, it has begun pollution control systematically. It has controlled pollution at about 1,900 enterprises and units. It has been rigorously enforcing the principle of the "three simultaneous efforts," effectively controlling new pollution sources from new construction, expansion and reconstruction.

Moreover, Hebei has zeroed in on pollution of the Guanting Reservoir, Baiyangdian Lake, the Bo Hai coast, and the Qingzhang He, basically solving the serious pollution in those bodies of water. The largest lake in the North China plain and a rich producer of reed, Baiyingdian was heavily polluted as a result of water being diverted by the construction of a reservoir upstream and discharge of industrial effluent by Baoding City. After treatment, the quality of water has improved and the amount of reeds has increased. Efforts are now being made to restore the lake to its natural ecology.

In recent years, scientific research on environmental protection has also produced results. Among the 123 projects on environmental science, 14 have passed technical appraisement, eight of them winning provincial or municipal scientific technological awards.

12581
CSO: 4008/128

HUNAN PAPER MILLS CAUSE SERIOUS WATER POLLUTION

Changsha SHICHANG TIAOJIE in Chinese 25 Nov 83 p 1

[Text] Currently, effluent from all the paper mills in Hunan exceeds the national standard; 132 million tons of waste water, containing large quantities of toxic substances such as sodium hydroxide, sodium oxide, sodium sulphide, etc., is discharged into rivers and lakes every year, endangering the ecological balance.

Of the 214 paper mills in our province, 104 are within the plan, while the other 110 are not called for in the plan. Last year they manufactured 314,500 tons of paper and plan to produce 330,000 tons this year. Calculated at 400 tons of effluent discharge for every ton of paper, the 214 paper mills discharge more than 130 million tons of effluent a year. According to relevant state regulations, the suspended substances, chemical oxygen demand and biological oxygen demand in the effluent from paper mills are respectively 500 PPM (number of parts of the harmful material in every 1 million parts of water), 300 PPM and 60 PPM. There should not be any dirty or stinky water, either. Although 6 paper mills in Hunan are equipped with soda recovery equipment, even the mills that have succeeded in soda recovery exceed the standards by 100-200 percent. Mills not called for in the plan exceed the standard 10 times.

The large quantity of effluent discharged into rivers and lakes by the paper mills, and the large quantity of organic substances floating on the surface of the water cause marine organisms to lack oxygen and die. If the situation is not improved, sooner or later Dongting Hu which has the reputation as "land of fish and rice" will not be worthy of the title.

12369
CSO: 4008/104

CONFERENCE ON ECOLOGICAL ENVIRONMENT OF DIAN CHI AREA

Kunming YUNNAN RIBAO in Chinese 8 Feb 84 p 2

[Article: "Conference on 'The Investigation and Economic Assessment of the Ecological Environment in the Dian Chi Area Convened in Kunming"]

[Text] From January 24 to 26, the Provincial Scientific Association and Provincial Construction Bureau invited about 30 concerned specialists and scholars in Kunming to carry out an evaluation and assessment of the scientific research project: "An Investigation and Economic Assessment of the Ecological Environment in the Dian Chi Area" jointly organized by the Yunnan Environmental Studies Association and the Provincial Agricultural Studies Association.

This scientific research project has been initiated by the Geography Department of Kunming Teachers College and the Provincial Environmental Science Institute. It involves more than 10 scientific workers and teachers of the provincial and city economic research institutes, provincial aquatic product and atmospheric research institutes and departments concerned in the geological and forest surveys. Combining their own jobs with their spare time, they conducted many investigations, statistical surveys, tests and research and completed the project after one and a half years of hard work. Based on a large quantity of data, they have made a systematic analysis and meaningful investigation into the conflicts and developmental changes of the population, resources, environment and economic development of the Dian Chi area. They exposed existing problems in the present construction and put forth some proposals for rational development. This has a definite reference value for departments concerned.

The representatives have conducted serious study and discussion of the various specialized reports, consider them to have depth and provide meaningful information on the "management of national land" as well as a scientific base for developing the city of Kunming.

12380
CSO: 4008/193

RESULTS OF ENVIRONMENTAL PROTECTION IN SUZHOU

Nanjing XINHUA RIBAO in Chinese 25 Jan 84 p 2

[Article: "Suzhou's Environmental Protection Obtains New Results"]

[Text] Environmental protection efforts in Suzhou have brought new results: by the end of last year, 199 treatment projects had been completed, and 379 boilers, accounting for 90 percent of the total number, had been renovated or rebuilt. Consequently, in the last few years while industrial production has been increasing, the chief indicators of water and air pollution have all been lower than those of the latter part of the 1970's. Out of the 278 stationary noise sources, 73 percent have been controlled and environmental quality has improved.

To successfully protect the environment Suzhou has adopted the following measures.

1. By concentrating efforts on key pollution sources, the treatment projects of 90 units whose deadline for control has been set by the state, province and city had all been completed by the end of last year. Pesticide waste water discharged by the Suzhou Chemical Plant was seriously polluting the water quality of the Grand Canal. Last year, the director of the plant took charge and organized efforts to focus on key problems. By the second half of the year, the treatment project for the blasting and aeration of pesticide contaminated water was completed and it can treat up to 5,200 tons every day. The Suzhou Meat Association Plant adopted measures to treat the waste water from slaughter so that all indicators meet the national discharge standards, thus solving an old, major and difficult source of pollution.

2. Industrial distribution was regulated, the principle of designing, constructing and operating antipollution equipment simultaneously with the principal part of new building projects was implemented, thereby controlling the development of new sources of pollution. Based on the foundation established by the professional cooperation center for electroplating, casting, forging and thermal treatment founded a few years ago, Suzhou also built a bleach and dyeing center last year. It centralizes bleaching and dyeing sites scattered throughout the city and carries out the centralized processing of textile dyeing and centralized treatment of waste water, thereby reducing the pollution caused by the waste water from dyeing. In recent years, the

city has also closed, suspended, merged or retooled 13 plants that were causing serious pollution. All products of the plants moved out of the city are examined by the environmental protection department, and the "three simultaneous efforts" are carried out to control the rise of new sources of pollution.

3. Pay attention to the use of new technology to treat "the three wastes," recycle waste, and comprehensive utilization, to realize the unity of environmental and construction results. The Suzhou Hecheng Chemical Plant uses the new technology of substituting ion exchange membrane for sulphuric acid as the catalyst to eliminate the discharge of waste water, save large quantities of sulphuric acid and acetic acid, and get rid of pollution. According to the statistics of 25 units such as the Suzhou Sulphuric Acid Plant, through comprehensive utilization, several different kinds of raw material for chemical and light industries and building material with a total value of more than 5.24 million yuan were recovered last year.

4. A specialized environmental monitoring system and monitoring by the masses and management and supervision by the masses have been improved, promoting the environmental protection of the city. In recent years, this environmental monitoring system has carried out analysis of the city's water and air quality at specific times and places, providing more than 72,000 pieces of monitoring data and the basis for pollution control and environmental management. In the city, 20 neighborhood and 262 residential committees have established popular environmental protection monitoring systems. The strengthening of monitoring has prompted many enterprises to solve the problem of waste water, and gas, and noise pollution.

12380
CSO: 4008/193

ENVIRONMENTAL CONDITIONS IN SHENZHEN CITY

Guangzhou NANFANG RIBAO in Chinese 13 Dec 83 p 1

[Text] Shenzhen City, thanks to the close attention paid to the overall planning of urban construction and environmental arrangements, has maintained a beautiful environment and ecological balance during its rapid development.

Since the formulation of the special economic zone in 1980, Shenzhen's urban construction has developed rapidly. The guiding ideology of the Shenzhen City government during urban construction is: gradually construct a modernized Chinese-style socialist city with a rational layout, new and original buildings, beautiful surroundings, fresh air, convenient transportation and comfortable housing. Based on this idea, they conscientiously paid attention to the following tasks:

Overall planning, rational distribution and insistence on the "three simultaneous efforts." It stipulated that all enterprise and business units must accord with overall planning and rational layout when choosing sites. New construction, reconstruction or expansion have to be examined and approved jointly by environmental protection departments and other concerned departments. Anti-pollution facilities should be designed, constructed and put into operation at the same time as the principal part of the project. Last year, Hong Kong businessmen and the Yantian Commune violated the urban construction layout by building the Yantian Cloth Washing Plant near the bank of Dapengwan without reporting it and getting approval. Concerned departments reported this to the city government and requested the plant stop production and remove the buildings.

Development of environmental monitoring, and investigation and research. Large-scale investigation and research on the entire special zone's environmental conditions has been undertaken since the winter of the year before last. Based on this, assessment of the construction's environmental impact on the special zone was made. Currently, scientific research has been launched to study the environmental capacity of Shenzhen's water to provide Shenzhen He and Shenzhen Wan with a reliable basis for pollution prevention.

Strengthening the construction of environmental protection organizations and the regulations on environmental protection. Environmental protection organizations have been set up at city, regional and county levels. At the

end of last year, the "Environmental Protection management regulations for Shenzhen City" was issued by the city government. Concerned departments also formulated environmental management regulations and control standards for air, water and soil, etc.

In recent years, due to the attention paid to the above-mentioned work by the entire city, the environmental quality of the entire special economic zone basically remains in good condition. The waters along the coast, especially Dapeng Wan, maintains the standard of first class seawater and is deeply appreciated by tourists from home and abroad. The sulphur dioxide, carbon dioxide, ozone, particulate matter, etc. in the air over most of the area, after being examined and analyzed, were all below the secondary standards of the state's regulations.

12369
CSO: 4008/104

MEETING HELD ON ENVIRONMENTAL PROTECTION OF TAIYUAN

Taiyuan SHANXI RIBAO in Chinese 26 Oct 83 p 1

[Text] "Environmental Protection and economic construction should be carried out simultaneously," stressed Gu Wenpo [6253 2429 3134], Deputy Secretary of the Taiyuan City Committee, in his speech at the mobilization meeting held in the provincial capital for the promotion of environmental protection.

The mobilization meeting, held on 25 October in the Hubin Hall, was co-sponsored by the Provincial and Taiyuan City Environmental Protection Bureau. Attending this meeting were leading comrades from concerned parties such as the Standing Committee of the Provincial People's Congress, Taiyuan City Committee, City Government, etc. Also, there were more than 4,000 cadres and masses from subordinate counties and regions of Taiyuan City, colleges and universities, troops and various enterprise and business units participating in this meeting.

After reviewing the provincial capital's achievements in the prevention of environmental pollution, Gu Wenpo pointed out that currently the provincial capital's environmental pollution was still very serious, and in some areas it was even deteriorating. Compared to the ten-odd biggest cities in the nation, Taiyuan City's discharge volume of the "three wastes" and the density of toxic and hazardous substances in the air is among those having the most serious environmental pollution. If these problems are not solved, they will definitely affect the construction of the heavy chemical industrial and energy base, endanger the health of the masses and leave a legacy of trouble for future generations.

The meeting decided to make October 25-November 25 "Environmental-Protection Propaganda Month" so as to promote the provincial capital's construction of the "two civilizations" and implement the overall urban plan for Taiyuan City. Through the activities of the environmental protection propaganda month, make the significant meaning of pollution prevention and environmental protection known to every household, strike root in the hearts of the people, carry out thoroughly the environmental protection law, and insist on these two principles: "Whoever pollutes has to control it" and everybody is responsible for environmental protection. All of us should take action enthusiastically and strive for the early construction of a beautiful Taiyuan City.

12369
CSO: 4008/104

'THREE WASTES' TREATMENT IN SHANGHAI REPORTED

Beijing JINGJI RIBAO in Chinese 13 Aug 83 p 2

[Article by Lu Jinong [7120 4949 6593]: "Success and Failure of the Comprehensive Utilization of the 'Three Wastes' in Shanghai"]

[Text] This correspondent recently conducted an investigation on the comprehensive utilization of the "three wastes."

Turning Waste Into Treasure and Harm Into Benefit

The precious and rare metal refining plant under the Shanghai Municipal Material Recovery and Utilization Company is basically undertaking the task of recoverying and utilizing the waste water and residue of more than 1,300 different enterprises throughout the municipality. Last year, this plant extracted 80 kilograms of gold, 16 tons of silver, and nearly 1,000 tons of various chemical products from waste water and residue. Its total output value was more than 12 million yuan.

There are more than 300 hospitals and photo studios in Shanghai, and each year, more than 300 tons of fixer fluid containing silver is discharged into the sewage causing water pollution. Since 1966, the precious and rare metal refining plant has made door-to-door collection of this fluid, and in 16 years, extracted more than 12,000 kilograms of silver.

In Shanghai, there are more than 14,000 restaurants and mess halls. Everyday, a huge volume of oily water flows into the drainage pipes causing clogging and overflowing, which affects sanitation. The Shanghai Municipal Material Recovery and Utilization Company installed oil separators at the entrance of drainage pipes near the major restaurants for the recovery of oil. From the oil recovered each year, approximately 400 tons of pure oil and fat can be extracted for soap production.

In Shanghai there are 780 plants that consume more than 400,000 tons of sulphuric acid fluid which corrodes the sewage pipes, pollutes the rivers and damages farmland. The municipal recovery and utilization company organized recovery of the discarded acid fluid based on density and supplied it to the proper plants to be recycled. From 1957 to 1982, 3.15 million tons of this acid was recovered and reused, thus helping the state to save more than 1 million tons of sulphuric acid and hydrochloric acid, and to make more

than 140 million yuan. This played an important role in urban environment protection and pollution reduction.

Rate of "Three Wastes" Recovery, Utilization Still Low

There are still some problems in Shanghai concerning the recovery and utilization of the "three wastes." First, the rate of waste acid recovery and utilization is low. In Shanghai, this rate is approximately 12 percent, and a large amount of waste acid is being discharged into the rivers. According to a survey conducted on 60 plants by concerned departments, if the 480,000 tons of waste sulphuric acid of more than 5 percent density discharged each year is fully used, approximately 30,000 tons of sulphuric acid can be saved. Second, there is lack of unified management. Several units are competing for large profits; if profits are low no one is interested in recovery. This problem can be solved through unified management. Third, equipment and technology are backward. In Shanghai, there are only a few large plants having equipment for concentrating waste acid for their own use. Without this equipment, the precious and rare metal recovery and utilization company is unable to recover the large amount of low-density waste acid from all acid-using plants, and can only let the precious and rare metal be washed away.

Some Proposals

In order to fully use the "three wastes," the departments concerned have offered the following proposals:

1. A "three wastes" recovery center should be set up and charged with the responsibility for overall utilization. A thorough investigation should be conducted on the treatment of the "three wastes." With a view to improving the city's hygienic conditions and the economic results of waste recovery, we should work out certain exemplary measures for the comprehensive utilization of all discarded materials in order that we may gain the necessary experiences to be gradually popularized.

2. In the treatment of waste acid, aside from organizing its recycling, we should use the technology of concentrating the liquid acid of low density for producing regenerated acid. Concentrated regenerated acid calls for less investment and lower consumption, but produces better effects. As we have heard, the investment in the construction of a regenerated acid workshop is only one-third of that of an ordinary sulphuric acid workshop.

3. In building or expanding factories, we should consider the overall utilization of the "three wastes" from the standpoint of their geographic distribution. If necessary, we can build small factories so that the discarded material of one factory will become the raw material of another.

4. Environmental protection, and scientific research departments and institutions of higher learning should conduct research into the comprehensive utilization of the "three wastes" to provide the technology for treatment of the "three wastes."

9411
CSO: 4008/209

LESSONS LEARNED FROM WUHAN POLLUTION INCIDENT

Environmental Protection Work Improved

Beijing ZHONGGUO FAZHI BAO in Chinese 25 Feb 83 p 1

[Article by Jiang De [5592 1795] and Qin Liwen [4440 0500 2429]: "Chang Jiang Shipping Administrative Bureau Learns Lesson: Strong Emphasis on Environmental Protection Work Brings Preliminary Results; All Sources of Pollution Along the Chang Jiang Will Be Investigated; Measures Have Been Formulated To Treat These Sources by Periods and in Groups; All Projects Lacking Measures To Protect the Environment Will Not Be Allowed To Commence; Wuhan Port Has Added Dust Covers to All Coal Unloading Machines and Installed Anti-Dust Spray Equipment, and All Coal Yards Have Been Equipped With High-Pressure Water Guns"]

[Text] The Chang Jiang Shipping Administrative Bureau of the Ministry of Communications has learned a lesson from the incident that occurred at its Pier 41 at Wuhan Port. This incident involved environmental pollution, which aroused dissatisfaction among the masses. The bureau has changed its work style, earnestly studied and implemented the "(Trial) Environmental Protection Law of the PRC" and caused a new situation to appear in environmental protection work. Now the black "mushroom clouds" covering the chain-trolley coal unloading machines have started to disappear, and other powder, dust and wastewater that pollute the environment are being treated.

Pier 41 at Wuhan Port is a special pier for the loading and unloading of coal and has two chain-trolley coal unloading machines. Because the equipment is old and operations are conducted in the open air, black "mushroom clouds" are generated all around whenever the machines are in motion, seriously polluting the environment and causing residents of the 7 February Complex near Pier 41 to fear to open their windows and to relax in cool places outdoors in the summer. The residents repeatedly sent their views to the Wuhan Port Office and the Chang Jiang Shipping Administrative Bureau, demanding that the pollution problems be resolved but were never able to arouse the attention of the leaders of the two bureaus and thus became very dissatisfied. On 3 days, 5-7 July, some angry masses broke into Pier 41 three times when it was in operation. They forced a halt to the unloading of coal, smashed some equipment and caused direct losses amounting to more than 11,000 yuan. After the incident, leading comrades of the CPC Central

Committee severely criticized the leaders of the Chang Jiang Shipping Administrative Bureau for neglecting the people's interests and for their bureaucratic work style.

The smashing incident at Pier 41 and the criticism from the leading comrades of the CPC Central Committee strongly shook the Chang Jiang Shipping Administrative Bureau. The bureau party committee convened three standing committee meetings to examine the bureau's bureaucratic work style. With the help of responsible comrades of the CPC Central Committee and provincial and municipal leaders, the bureau has begun to understand that for a long time it has set production and environmental protection in conflict with each other. Whenever environmental protection was mentioned the bureau would stress the importance of production tasks, the lack of funds to make improvements, poor technical conditions and other reasons. The bureau lacked understanding of how to implement the environmental protection law and of the importance of environmental protection to the people's vital interests, and the bureau turned a deaf ear to the voice of the masses, which actions indicated conclusively that there was serious bureaucratism in the bureau. After the bureau's understanding was enhanced, leading comrades of the party committees of the port office and shipping bureau personally went to the scene to acquaint themselves with the situation, formulated measures to control pollution and sent representatives to listen to residents' critical views and to give explanations. Subsequently, the party committees also convened an on-the-spot meeting at Pier 41 on dust prevention work along the entire Chang Jiang and demanded that subordinate units learn a lesson from the smashing incident, change work styles conscientiously, earnestly implement the environmental protection law and do a good job in environmental protection work. The bureau party committee also decided to set new limits on organizational size, personnel and funds, to strengthen the training of grass-roots environmental protection personnel and to place the same amount of stress on environmental work as is placed on safety. The bureau has organized its forces to examine coal, cement and phosphorous mining piers and all sources of pollution; formulated measures to treat those sources by periods and in groups; and will insure implementation of these measures by guaranteeing supplies of human, material and financial resources. In accordance with the related articles of the "(trial) environmental protection law," the bureau has also stipulated that, in all future capital construction projects, environmental protection components and main components be designed and constructed simultaneously. All projects without measures to protect the environment must not be allowed to start.

The change in leadership work style has brought about a new start in environmental protection work. After a half a year of efforts, dust covers have been added to all coal unloading machines at Wuhan Port, anti-dust spray equipment has been installed and all coal yards have been equipped with high-pressure water guns. The control of powder and dust in major coal ports such as Nanjing, Yuxikou and Zhicheng is underway. Many large ships that sail along the Chang Jiang have been equipped with oil-water separators, which have greatly reduced pollution of the river from engine wastewater.

Protection of Environment Urged

Beijing ZHONGGUO FAZHI BAO in Chinese 25 Feb 83 p 1

[Commentary: "Act According to the Law, Protect the Environment"]

[Text] Article 6 of the "(Trial) Environmental Protection Law of the PRC" stipulates: "The selection of the location, design, construction and production of all enterprises and units must pay full attention to prevention of environmental pollution and damage." Since Pier 41 under the Chang Jiang Shipping Administrative Bureau and the Wuhan Port Office formerly did not implement the environmental protection law and adopt dust prevention measures, coal dust flew all around during the unloading of coal and seriously polluted the environment, causing great dissatisfaction among nearby residents. Through teaching by criticism, the leaders of this pier have realized their errors, conducted self-criticism before the masses, adopted measures to eliminate pollution and gained the forgiveness of the masses. The lesson of Pier 41 should serve as a warning to concerned units.

Eliminating pollution and protecting the environment are vital to the people's interests. Some units and enterprises have varying degrees of pollution problems but do not deal with and resolve those problems conscientiously. Of course, it takes a certain amount of material guarantee to eliminate pollution and protect the environment, but it would be very wrong if we did not try hard to resolve those problems which can be resolved with a small amount of expenditure or easily. Concern for the livelihood of the masses is part of our party's fine tradition and should not be reduced at any time. Those people who are indifferent toward the harm suffered by the masses from pollution should think and ask themselves whether they share the viewpoint of the masses and whether they have forgotten the party's traditions.

To do environmental protection work well, we must strengthen appreciation of the legal system and conduct our work in accordance with the law. For those units and individuals who violate the environmental protection law, we should investigate their legal responsibility in accordance with that law. Only in this way can we protect the sanctity of the law, conscientiously protect the environment and safeguard the people's interests.

The State Council has recently announced several orders relating to the integration of technological transformation and the prevention of industrial pollution. These orders call for continued stress on the prevention and control of pollution and the protection of the environment and provide concrete measures to organically combine control of the "three wastes," comprehensive utilization and technological transformation. Every unit that has an environmental pollution problem must pay full attention to and conscientiously stress environmental protection work.

9586
CSO: 5000/4159

ENVIRONMENTAL RADIATION LEVELS, DOSAGE STUDIED IN GUIYANG, GUIZHOU

Beijing ZHONGHUA FANGSHE YIXUE YU FANGHU ZAZHI [CHINESE JOURNAL OF RADIOLOGICAL MEDICINE AND PROTECTION] in Chinese No 6, 25 Dec 83 pp 45-49, 75-76

[Article by Chai Tianfang [2693 1131 2455], Li Zhou [2621 5297] et al. of the Radiation Protection Office, Guizhou Province Hygiene and Epidemic Prevention Station: "Environmental Radiation Level and Its Population Dose in Guiyang City"]

[Summary] This paper presents the results of the environmental radiation level and its population dose in Guiyang, Guizhou Province. The environmental γ-exposure rate was measured by a Chinese-made FD-71 portable scintillometer and the accumulative dose of the environment and human body was determined with a highly sensitive LiF (Mg, Cu, P) - TLD. The concentration of the natural radionuclide scattered in building materials, soil and road-materials were analysed and their γ-dose rates were estimated. It was found that the results measured by above methods were in good accordance with one another. Furthermore, the radiation levels of various indoor and outdoor dwellings were also reported. For this purpose, the urban inhabitants were divided into two groups: group 1 included the residents who worked mainly indoors, and group 2 worked chiefly outdoors. It was detected that the weighted average annual gonadal dose rate of the population was 101.4 mrad/y in group 1 and 91.3 mrad/y in group 2.

CSO: 4009/48

STUDY OF GAMMA RADIATION LEVELS IN HEBEI PROVINCE REPORTED

Beijing ZHONGHUA FANGSHE YIXUE YU FANGHU ZAZHI [CHINESE JOURNAL OF RADIOLOGICAL MEDICINE AND PROTECTION] in Chinese No 6, 25 Dec 83 pp 4-7, 72

[Article by Zhou Lingjiang [6650 6647 3068], Cui Guangzhi [1508 1684 1807] of the Industrial Hygiene Laboratory of the China Preventative Medicine Center, et al.: "Terrestrial Gamma-radiation Levels and Distribution in Hebei Province"]

[Summary] In situ measurements of natural terrestrial γ-radiation were conducted in Hebei Province in 1982. A Reuter-Stokes RSS-111 high pressure ionization chamber and a FD-71 scintillation survey meter were used. The range of the terrestrial γ-radiation level was from 5 to 15.7 μR/h. The terrestrial γ-radiation population-weighted mean absorbed dose rate in the air was found to be 6.6 μrad/h in Hebei Province.

CSO: 4009/48

BRIEFS

XI'AN SEWAGE TREATMENT SYSTEM--China's largest urban sewage treatment system has recently been constructed and put into operation at the Dengjia Village Sewage Treatment Plant in the northwest suburbs of Xi'an. It has a daily capacity of 120,000 tons and can handle the initial treatment of the industrial waste and domestic sewage of the 130 factories and 320,000 residents of the western suburbs of Xi'an. [Text] [Beijing RENMIN RIBAO in Chinese 8 Jan 84 p 1] 9705

SHANDONG HANDLES INDUSTRIAL WASTES--In the past few years, industrial and communications enterprises in Shandong Province made achievements in the development of environmental protection undertakings. The state and the enterprises invested 150 million yuan to handle pollution sources among 30 percent of the enterprises at and above the county level in the province. Some 45.7 percent of waste gas, 30 percent of waste water, and 41.8 percent of waste residue among chemical industrial enterprises have been purified and comprehensively utilized. Textile industrial enterprises established 79 facilities with a daily capacity of 100,000 tons of waste water. According to incomplete statistics, the chemical, metallurgical, petroleum, and building material enterprises can comprehensively use over 100 million yuan of waste annually. [Summary] [Jinan DAZHONG RIBAO in Chinese 23 Jan 84]

HEILONGJIANG ENVIRONMENTAL PROTECTION MEETING--The Third Heilongjiang Provincial environmental protection meeting opened on 24 February. Deputy Governor Hou Jie revealed that Heilongjiang Province has discharged 1.9 billion tons of polluted water, 506 million cubic meters of waste gas, and 16.2 million tons of waste residue annually. The environmental protection work will be carried out in two stages. Pollution of the Songhuajiang River system and key cities such as Harbin, Qiqihar, Mudanjiang, and Jiamusi will be brought under control prior to 1990. Environmental construction will be concentrated in 10 years from 1990 to 2000 so as to restore the province's natural ecological situation to normal, and to beautify the environment. [Summary] [Harbin Heilongjiang Provincial Service in Mandarin 1000 GMT 24 Feb 84 SK]

SHANGHAI SEWAGE PROJECT--The largest municipal engineering project of Shanghai, the south Shanghai sewage main reconstruction project, is picking up speed. After 6 months of busy construction, over 50 percent of the piping work has been completed. The south Shanghai sewage pipeline is a 20-kilometer long sewage discharge pipe serving Xihui, Nanshi, Luwan and part of Huangpu wards. It was originally an "open-ditch type" and has now been converted entirely into "pipelines" using rectangular steel-reinforced concrete pipes 2.1 meters tall and 3.2 meters wide. The project also included the construction of four large pump stations and 20 reverse syphon pipes. After the burial of the pipes, 18 kilometers of road were built and 17 bridges were also built along the way. The city sewage converges at Rihui harbor, passes through the Huangpu Jiang and is pumped up to the vicinity of Chuansha Bailong harbor in Puding and then discharged into the East China Sea. [Text] [Shanghai WEN HUI BAO in Chinese 19 Apr 83 p 1] 9698

HANGZHOU CLOSES MORE WORKSHOPS--Beijing, February 9 (XINHUA)--Eighteen pollution-causing industrial workshops have been removed from the banks of West Lake in Hangzhou, one of China's best-known tourist resorts, ECONOMIC INFORMATION reports today. They were the last of 100 electroplating and heat-treatment workshops and foundries removed from the scenic spot since 1982. Previously these enterprises discharged dust and poisonous gas into the lake and its surrounding residential areas. Work left unfinished by the shut-downs will be sent to factories fitted with anti-pollution equipment located away from the city center. Hangzhou last year enlarged its sewage treating capacity by 30,000 tons and began diverting water from a nearby river to clean up the scenic lake. [Text] [OW091226 Beijing XINHUA in English 1148 GMT 9 Feb 84]

CSO: 4010/82

NUCLEAR WASTE DISPOSAL WILL NOT HARM ENVIRONMENT

HK231159 Beijing RENMIN RIBAO in Chinese 17 May 84 p 5

[Article by Huang Zhong [7806 6988]: "Nip an Evil in the Bud--On Disposal of Nuclear Waste"]

[Text] In the same way as in other industrial production, the generation of nuclear power will give rise to waste gases, liquids, and solids. These wastes are, to varying degrees, radioactive and are usually referred to as the "three wastes" of a radioactive nature. In order to prevent these waste materials from polluting the environment, they must be handled and disposed of in various different ways according to the degree of their radioactivity. Generally speaking, waste materials of low radioactivity are treated by the process of purification, and waste materials of high or medium radioactivity are concentrated, solidified, and completely isolated from the surrounding environment.

Of the "three wastes" produced in the course of generating nuclear power, radioactive waste liquids account for the greater part of the total volume. They are the most harmful and involve the most complicated treatment. After going through the processes of chemical deposition, evaporation, and ion exchange, waste liquids of low radioactivity are drained off or used again if they reach the requirements for drainage. Waste liquids of medium radioactivity are solidified into asphalt or cement blocks and are buried below the surface of the earth. Waste liquids of high radioactivity are first solidified into glass blocks. The glass blocks are put into special vessels before they are buried deep below the surface of the earth and given geological treatment [di zhi chu li 0966 6347 5710 3810]. These highly radioactive waste materials, which are buried deep below the surface of the earth, are completely isolated from the biosphere by four barriers--glass blocks, vessels, replaced soil, and geological strata. They will not have any harmful effects on the environment for millions of years.

Although the nuclear industry will give rise to "three wastes" of a radioactive nature, which form a potential danger of environmental pollution, we can guarantee that the nuclear industry will not pollute the environment by depending on contemporary science and technology and by adopting a series of effective measures in disposing of radioactive wastes.

CSO: 4008/313

DISPOSAL OF SPENT REACTOR FUEL SAID TO POSE NO INSURMOUNTABLE PROBLEMS

HK010940 Beijing RENMIN RIBAO in Chinese 18 Apr 84 p 3

[Article by Jiang Shengjie [1203 5110 7132], chairman, Science and Technology Committee, Ministry of Nuclear Industry, and Huang Qitao [7806 7871 7118], chief engineer, China Atomic Energy Industrial Company: "A Talk on the Processing of Spent Fuels From Nuclear Power Plants"]

[Text] Nuclear power is an energy resource with very good prospects. By the end of 1983, in 24 countries and regions in the world, a total of 302 nuclear power plants were operating, with a total installed capacity of 200,000 megawatts. It is predicted that by 1990, there will be 537 nuclear power plants with a total installed capacity of 420,000 megawatts. China also has started building nuclear power plants. By the end of this century, a number of pressurized-water reactor nuclear power plants will begin operation and will make due contributions to the attainment of our country's strategic goals.

Pressurized-water reactor nuclear power plants use low concentration uranium containing about 3.2 percent uranium 235 as their fuel. A 1,000-megawatt pressurized-water reactor nuclear power plant needs to be loaded with 80 tons of uranium as its fuel, and one-third of its fuel, or about 27 tons, has to be replaced annually. The spent fuel removed from the reactor is still strongly radioactive. Therefore, the proper treatment of spent fuel is a matter of great public concern in countries all over the world. Some people doubt that spent fuel treatment techniques have been mastered; some people worry that the after-use treatment process causes environmental pollution, and so on. These worries are understandable but unnecessary.

People often describe the used nuclear fuels from nuclear power plant as "nuclear waste" or "radioactive refuse." These terms mislead people to think that they are purely waste materials which are not only useless but can cause grave, harmful effects because of their radioactivity. Actually, this is not true.

Nuclear power plants use fuel in a way different from thermal power plants; the latter can burn away all the fuel such as coal or petroleum, but the former cannot "burn" away all the nuclear fuel. The spent fuel from a pressurized-water reactor still contains a large quantity of uranium.

Moreover, plutonium, a new nuclear fuel, is produced in the spent fuel. This kind of plutonium differs from another kind of plutonium used for making nuclear weapons and it can be used for industrial purposes. Aside from plutonium, there are considerable quantities of superuranium elements, such as neptunium, americium, curium, and so on, which do not exist in nature, which are artificially synthesized elements, and which are very valuable. To sum up, quantitatively speaking, useful substances constitute a majority of the used fuel from nuclear power plants. However, to utilize these useful substances, we must process them, and this process is known as spent fuel treatment in nuclear industrial production. Spent fuel treatment is an indispensable and important link in the entire nuclear fuel cycle. There is no question about its importance.

Spent fuel treatment has the following advantages:

1. With the retrieval of uranium which has not been "burned" away, uranium resources can be more fully and rationally used. From a 10,000-megawatt pressurized-water reactor nuclear power plant, 250 to 300 tons of spent fuel is removed annually which contain 238 to 286 tons of uranium that has not yet been "burned" away. The recovery of uranium for our use through after-use treatment means that we can annually reduce the excavation and processing of natural uranium ore by 200,000 to 300,000 tons. This is very important to our country.

2. Large quantities of plutonium for industrial use can be made available. From the fuel removed from a 10,000-megawatt pressurized-water reactor nuclear power plant, around 2.3 to 2.7 tons of plutonium can be obtained annually. This kind of plutonium can be used as a fuel for fast neutron breeder reactor nuclear power plants, or can be mixed with natural uranium to form oxide fuels for replacing low concentration uranium fuel used in regular pressurized-water reactor nuclear power plants.

3. Superuranium elements such as neptunium, americium, curium, and so on, can be extracted and then used by various national economic sectors. Neptunium 237 can be used as a raw material for producing plutonium 238, which can be used to manufacture nuclear cells for use in the astronautic sector. Americium 241 can be used in the processing of neutron sources, smoke alarms, static electricity removers, and so on. At present, there is a world-wide shortage of these products.

4. Nonradioactive rare gases such as xenon and valuable metals such as palladium and rhodium can be isolated and recovered to make up for the inadequacy of natural resources. Radioactive cesium 137 can be isolated and recovered and used as a source of radiation in food storage, industrial sterilization, and so on.

5. Because radioactive elements with a long half-life, such as plutonium, neptunium, and so on, are removed, the radioactivity of the waste substances from used nuclear fuels is greatly reduced, so that the technical difficulty in the safe storage of these waste substances is greatly reduced.

Today, several countries have already mastered the techniques of treatment of spent fuel components from pressurized-water reactor nuclear power plants. China mastered military-purpose spent fuel treatment techniques long ago, and has carried out a great deal of scientific research concerning this treatment of fuels from pressurized-water reactors. If we further vigorously grasp technological development and organize the forces from various quarters to cooperate, it is absolutely possible for us to master quickly the entire technology in this area.

The treatment spent fuel from pressurized-water reactors can be roughly divided into four aspects: The transportation of components, intermediate storage, treatment, and the final disposal of strongly radioactive waste. No one doubts the safety of the first three aspects because of the many years of world-wide experience. For example, many countries have had large quantities of nuclear fuels transported over land and sea and no accident has ever occurred. Over the past 20 years or more, a great deal of experience has been accumulated in using water tanks for the intermediate storage of spent fuel from pressurized-water reactors, and this has proved to be safe and reliable. New techniques of intermediate storage are being developed. Spent fuel treatment can be carried out without any conspicuously undesirable effects on the environment if the plant site is appropriately chosen, if relatively high safety and precautionary standards are adhered to, if rigorous safety and precautionary measures are adopted, and if management and operation standards are raised. The records of many spent fuel treatment plants at home and abroad have proved this point.

The final disposal of strongly radioactive waste means the adoption of appropriate methods to permanently isolate this kind of waste from man and all other living organisms. Over many years, various countries have put forth many disposal schemes, for example, burying the waste deep in the earth's strata, in the deep seabed, in the arctic ice, or sending it into space. Judging from present circumstances, a relatively practical method is to bury it deep in the earth's strata. The safety of this method has been acknowledged by more and more people. In October 1980, the United States Department of Energy published the "Report on the Environmental Effects of the Final Disposal of Commerical Nuclear Waste in the United States," which formally put forth the scheme of digging nuclear waste storage spaces deep in the earth's strata, and which expressed the resolution to build the first national storage space to be completed and to go into use by 1998. This resolution demonstrates that the final disposal of strongly radioactive waste has now gone beyond the stage of study and initial development, and has entered the stage of full-scale industrial application.

Some people have made the following estimation: If an underground storage space of this category is built within 70 km of a district with a population of 2 million, the dosage of radiation which is collectivley received by the residents during excavation and which is caused by radon and its derivatives will be 1 percent of the basic natural figure, while the dosage received by the residents in the case of an accident caused by the damage of a container in transit holding some nuclear waste that has been cooled

for 20 years will be 0.1 percent of the basic natural figure. In analyzing the risks associated with storage spaces, some foreign countries have also made estimations about the consequences of various kinds of major accidents, for example, the impact of a huge meteorite right above a storage space, flooding caused by the rupture of rock layers, the infiltration of underground water, and so on. Even if these things occur, the dosage of the resulting radiation will be merely around 1 percent of the basic natural figure.

It should be mentioned that some 2 billion years ago a natural large-scale chain reaction fission of uranium occurred underground below (Ao-ke-luo) in Gabon, Africa. Today, this "natural reactor" has been continuously working for 600,000 years. The majority of residue from nuclear fission and the majority of superuranium elements remain in the neighborhood of the place. This discovery strongly proves that a favorable geological environment can ensure that radioactive nuclear substances can be permanently separated from the biosphere. Actually, the radioactivity of nuclear waste stably stored underground is neglible compared with that of the "natural reactor." The disposal of nuclear waste deep in the earth's strata is safe and relible.

China has a vast territory. There are many sparsely populated areas with stable geological conditions. Compared with certain densely populated countries with a small territory, we are in a favorable position for developing the disposal of nuclear waste deep in the earth's strata.

CSO: 4013/160

EXPERTS SEEK TO EASE FEARS OF ENVIRONMENTAL CONTAMINATION

OW200325 Beijing XINHUA Domestic Service in Chinese 1252 GMT 18 Apr 84

[Excerpts] Beijing, 18 Apr (XINHUA)--Two nuclear experts from our country pointed out today: Although the radioactivity of spent nuclear fuel is still very strong, it is possible to prevent environmental pollution from such radioactivity, if reprocessing technology is properly applied.

With the development of nuclear power stations, some people at home and abroad worry about nuclear contamination. One of the problems which concerns people is that the strong radioactivity of fuel used by nuclear power plants may cause environmental pollution. On this problem, Jiang Shengjie, chairman of the Scientific and Technological Committee under the Ministry of Nuclear Industry, and Huang Qitao, chief engineer of the China Atomic Energy Industrial Company, jointly wrote an article entitled "On Reprocessing Fuel Used by Nuclear Power Plants." The article says that it is understandable that people have such misgivings, but it is unnecessary for them to worry.

The article says: People commonly refer to the nuclear fuel used by nuclear power plants as "nuclear waste" or "radioactive refuse," and describe it not only as useless but as very harmful because of its strong radioactivity. Actually, this is not the case. The way a nuclear power plant uses its fuel is different from how a thermal power plant does--the latter can consume such fuels as coal or oil, while the former cannot "burn" nuclear fuel completely. Spent nuclear fuel still contains a certain amount of uranium; in addition, it also produces a new nuclear fuel, plutonium, and such transuranic elements as neptunium, americium and curium. These transuranic elements, which do not exist in nature, are very valuable synthetic elements. In a word, most of the fuel used by a nuclear power station is useful material.

The article says: Several countries have now grasped the technology to reprocess nuclear fuel, and our country has also done a lot of scientific research on such technology. It is entirely possible for us to grasp all the technology necessary to reprocess nuclear power plant fuel rapidly, provided we organize forces in various quarters to make coordinated, vigorous efforts to further develop the necessary technology.

The article admits: Reprocessed nuclear fuel is still radioactive, which may cause environmental pollution. Using proper methods to cope with this problem, such as burying reprocessed nuclear fuel deep underground, it will be isolated forever from humans and other living organisms.

CSO: 4013/149

POLLUTION IN DALIAN BAY, CONTROL MEASURES DISCUSSED

Beijing HAIYANG KEXUE [JOURNAL OF MARINE SCIENCE] in Chinese No 5, 9 Sep 83
pp 53-57

[Article by Wu Jun [0702 0193], Dalian Environmental Sciences Research Institute: "A Summary of Research on Environmental Pollution and Comprehensive Pollution Prevention in Dalian Bay"]

[Text] Between 1978 and 1982, various studies of environmental pollution and its comprehensive prevention in Dalian Bay were conducted. The following is a summary thereof.

Investigations of the Sources of Pollution

Located on the southern tip of China's Liaodong Peninsula, Dalian Bay is semi-enclosed and has an area of 224.13 square kilometers. Investigation revealed that the bay receives 431 million cubic meters of effluents annually, of which industrial wastes comprise 413 million, or 95.8 percent, and domestic sewage, 18 million, or 4.2 percent. Along with these effluents, over 80 types of pollutants enter the bay, the principal of which include oil, whose annual discharge is 11,832 tons; arsenic, 1,365 tons; phenol, 386.28 tons; cyanide, 316.34 tons; and organic substances (benzene, methylbenzene, methanol, formaldehyde, and acetaldehyde and the like), 5,545.81 tons. The bay also receives over 20 types of industrial waste residues, the annual discharge of which is 727,400 tons and which primarily include calcium chloride and residue from sulfur and iron ores.

The coastal drainage works along Dalian Bay were first constructed in 1898. By the end of 1979, there were 563.3 kilometers of drainage pipes in Dalian, which system covers 70 to 75 percent of the city and is linked to 101 direct outlets into the bay (including 5 small rivers, 23 open ditches, 22 covered drains and 51 enclosed pipes), which discharge all sewage and most of the residue into the bay.

Dalian Bay originally was scenic and rich in aquatic resources. Discharge of the "three industrial wastes," however, has forced abandonment of aquatic breeding zones and several thousand mu of shoreline, severely affected marine life and thus damaged the national economy. Furthermore, the people's health, parks, afforestation and the natural landscape are endangered.

Evaluation of Environmental Quality

Studies of the environmental quality of Dalian Bay have combined evaluations of the past, the present, the sources of pollution and the sea area. Evaluation of the sources of pollution involved calculation of "discharge rank indices" and evaluation of pollutants, outfalls and polluting units. Besides industrial wastewater standards, this method also employed irrigation, fishery and biochemical standards and thus obtained four groups of values, through which a composite value was obtained. Finally, discharge indices were ranked according to size, thus revealing the principal pollutants in discharged wastewater and the primary sources and outfalls of wastewater and residue. The results are presented in tables 1, 2, 3.

Table 1.

Primary Sources of Pollution	Discharge Rank Index [DRI] (%)
Dalian [DL] Chemical Plant	54.53
DL Seventh Oil Refinery	11.95
DL Dye Plant	7.79
DL Rendering Plant	7.36
DL Port, City Government	4.82
DL Steel Mill	3.47
DL Potassium Chloride Plant	1.91

Table 2.

POs*	53	55	57	8	51	10	54	7	
DRI (%)	19.2	15.05	13.93	7.63	3.47	3.45	3.38	3.31	
POs*	76	78	4	70	56	77	92	5	27
DRI (%)	2.95	2.84	2.77	2.38	2.35	2.19	1.70	1.08	1.02

* Primary outfalls, by code numbers.

Table 3.

Primary Pollutant	COD	Oil	Phenol	Ammonia Nitrogen	Arsenic	Suspended Solid	Cyanide
1979 DRI (%)	73.43	9.65	5.01	4.92	3.44	1.33	1.09
1980 DRI (%)	1.10	2.39	1.53	1.67	0.92	1.70	1.07

Evaluation of the sources of pollution has enabled us to identify the primary polluting units, outfalls and pollutants and to establish bases and targets for the prevention of pollution in the bay.

Evaluation of the sea area has employed nondimensional indexing to illustrate pollution conditions; the permissible levels of key polluting factors as indices of standard values; and the index of 1.0 as a critical value, beyond which pollution is considered to have exceeded permissible limits. This method included evaluation of each pollution factor; such key environmental elements as water quality, sea bottom quality and benthons; and the quality of the general marine environment. In the process of the investigation, evaluation parameters were explored, models examined, weighted coefficients computed, grades determined and all sorts of diagrams and tables prepared.

The results of the evaluation indicate that since 1972 general environmental quality has steadily improved, but by 1980 that quality still remained at the level of severe pollution. The quality of individual environmental elements also improved. By 1980, water quality had attained the level of light pollution; benthons remained at the level of severe pollution; and the quality of the sea bottom gradually improved each year yet by 1980 still remained severely polluted. Zonal analysis indicated that, in terms of water quality, the lightly and nearly lightly polluted areas comprises 200 square kilometers, or 89 percent of the total sea area. In terms of bottom quality, the severely polluted zone covered 22.17 square kilometers, or 9.89 percent of the total; the relatively severely polluted zone covered 42.36 square kilometers, or 18.9 percent; the medium polluted zone, 129 square kilometers, or 57.56 percent; and the lightly polluted zone, 30.6 kilometers, or 13.65 percent. For benthons, the relatively severe pollution zone covered 224.13 square kilometers, or 100 percent of the total sea area, as did the severely polluted zone for general environmental quality. From the distribution of all types of pollution levels, it is apparent that the west is more severe than the east, the south worse than the north.

Finally, based on environmental economics, economic results, ecology and biological effect, a verification of the evaluation results was conducted. During the past several years, four oil-waste treatment plants have been constructed along the shores of the bay, and two more such plants were built at the new port outside of the bay. At sea, oil-spill recovery ships and oil enclosures have been added, all large ships (including fishing vessels) have installed oil-water separators and between 1978 and 1980 nearly 70,000 tons of oil were recovered. During the second half of 1978, moreover, the Dalian Chemical Plant discontinued use of high-arsenic ores, and some units have adopted other preventive measures. Thus, the quality of the environment has steadily improved, evidencing the success of prevention work over the past several years. Meanwhile, we have also employed planktonic indicators to verify the results of the zonal analysis, which indicators proved very low--only about 0.3--inside the contaminated-water equipment and the Dalian harbor breakwater. Thus zonal evaluation and ecological reaction show the same results. Since the sources of pollution are primarily distributed along the bay's western and southern shores, pollution was naturally found to be more severe in the western than the eastern and in the southern than the northern parts of the bay.

Environmental Capacity, Pollutant Volume Control and Standards for Oceanic Discharge

The control of pollutant discharge is the most important way of preventing marine pollution. In order to achieve that control, scientific standards must be established. By scientific standards, we mean environmental capacity, the core problem of which is the environment's self-purification capability.

1. Research on Self-Purification Capability

According to preliminary statistics, between 1972 and 1980 approximately 170,000 tons of oil, 12,000 tons of arsenic and 670,000 tons of COD were discharged into Dalian Bay. Yet, there now remain only 50,000 tons of oil, 1,000-some tons of arsenic and 3,000-some tons of COD in the water and on the bottom of the bay. Obviously, the bay possesses an enormous natural self-purification capability. Nevertheless, the precise temporal and spatial dimensions of this capability and how many types of pollutants the bay can accommodate are problems that we must continue to examine.

The self-purification mechanism of the area near the mouth of the bay has many facets, the principal of which is hydrophysics. Both domestically and abroad, most research in this area focuses on tidal currents and employs very complex computations involving finite-difference schemes for hydrodynamic-continuity and diffusion equations, computers and numerical analogs. Since the tides in Dalian Bay are of the regular semi-diurnal type, under which sea water flows back and forth through the mouth of the bay, thereby effecting exchange, the primary flow is reciprocating. We believe that tides and tide flow reflect a single tide wave process: tide levels and flood and ebb rates include reciprocal changes between flow speed, flow volume, water depth and other hydrologic factors. Data obtained from continuous observation of tides over many years include various hydrologic characteristics under all types of weather conditions and thus are sufficiently representative. We, therefore, have utilized much of this data and have conducted synchronous monitoring at 13 stations over a 25-hour period. By studying tidal range movement and variations in flood and ebb concentrations, we have computed tidal displacement capability. We have also drawn upon the methods employed by Parker et al. for San Francisco Bay and Kashi et al. for Tokyo Bay to calculate the exchange rate and displacement capability of Dalian Bay under various tidal range conditions. And we have studied the quantitative relationship between the transport of pollutants and sea water movement and the diffusion effect of the latter on the former. We have thereby estimated that between 1972 and 1980, 670,000 tons of COD, 105,000 tons of oil and 10,000 tons of arsenic were removed from the bay through exchange and that the diffusion coefficients ranged between 120,000 and 3,800,000. In addition, in order to ascertain the exchange capability of, and pollutant residence time in, the bay, we employed geochemical methods and the formula proposed by Hattori Akihiko (1980) and estimated that sea water and major pollutants remain in the bay between 10.2 and 17.5 days. We also calculated the decay rates for COD, oil and arsenic and discovered that, among these major pollutants, COD decays slowest, has the best conservative property and may therefore be treated as a conservative material. We also conducted selective studies of the geochemical qualitative equilibrium of arsenic in the bay, which indicated that the primary source of that substance was sulfur and iron residue

from the Dalian Chemical Plant. Such residue quickly precipitates to the sea floor where it dissolves into large amounts of arsenic, migrates with sea water, and a small amount of the residue forms a permanent deposit. Analysis indicated that 83.3 percent of the arsenic in the bay is dissolved, 16.47 percent, particulate; 52.96 percent is 3 valence, 47.04 percent, 5 valence; and 54.17 percent is inorganic, 45.83 percent, organic. Bottom quality core sample analysis revealed the depth of pollutant deposits and discharge history. The rate of sedimentation was calculated at 3.35 centimeters per year. Based on the above analysis and the rate of advective exchange, we discovered the geochemical equilibrium relationship of arsenic and established a mathematic model elucidating the bay's self-purification capability with respect to that substance.

2. Studies of Environmental Capacity

By environmental capacity, we mean the absolute volume of pollutants that an environment can receive within limits on concentrations permitted under environmental standards. This capacity formed the basis of our study of such pollutant purification patterns as dilution, diffusion, migration, conversion and decomposition. Each pattern was analyzed in terms of general, sea water, bottom quality and benthon capacities.

Strictly speaking, environmental capacity should be equal to the geometric volume relative to the sum of pollutant accretion and the environment's self-purification capacity. Yet, in terms of temporal effect, the latter--a function of time--is far more significant than the former--a finite constant.

Tidal displacement capability was measured by the rate of advective exchange, bottom capacity by the rate of pollutant sediment transport, biological capacity by the rate of biological shift following the introduction of pollutants into the sea, and the general environmental capacity is the aggregate of the capacities of these three key marine factors. Separate calculations were made for standard capacity, attained volume and residual capacity for each of the above. Standard capacity refers to the volume of pollutants an environment can hold, considering as a background level the amount of pollutants the environment contains and based on environmental standards. Attained volume is the amount of pollution an environment already contains. And residual capacity is the difference between standard capacity and attained volume. If biological effect is ignored, these calculations indicate that, based on first-order water standards, Dalian Bay currently possesses a residual capacity of 100 tons/day for COD, 1.1 tons/day for dissolved arsenic and 0 for oil. If biological effect is considered, no residual capacity exists for arsenic and oil, and COD also should not be increased further.

3. Volume Control and Oceanic Discharge Standards

The establishment of volume control and oceanic discharge standards for Dalian Bay should be premised on the protection of the environment, the restoration and preservation of ecological balance, the promotion of fishery production, the improvement of fishery catch quality and current economic and technological conditions. In addition to using environmental capacity as a basis, we should also consider the results of toxicity tests conducted on marine life, coordinate

our work with existing national and provincial standards and root that work in actual pollution conditions in the bay. In the process of this work, we computed permissible total discharge volumes, established volume and percentage shares for each polluting unit and set control targets.

Table 4 presents the values obtained when first-order water standards and industrial wastewater discharge standards are employed as control targets.

Table 4. Target Standards for COD, Oil, Arsenic

Pollution Measures	First-Order Sea Water			Industrial Waste		Discharge
	COD	Oil	Arsenic	COD	Oil	Arsenic
Discharge density (ppm)	183.9	2.78	1.23	100	10	0.5
Discharge volume (tons/day)	206.5	3.13	1.38	112.3	11.23	0.56
Water density, Western Shore (ppm)	3	0.05	0.05	1.63	0.18	0.02
Average water density (ppm)	2.09	0.032	0.014	1.13	0.11	0.0057

When we consider biological effect, much data obtained experimentally both domestically and abroad indicate that, when the oil content of water reaches 0.01 ppm, between 23 and 40 percent of all young fish are hatched deformed. In water with this level of oil concentration, fish and shellfish absorb an oily odor within 24 hours; and when oil concentration reaches 0.1 ppm, the odor is absorbed within 2 to 3 hours. Thus it is apparent that Dalian Bay's current oil concentration of 0.06 to 0.07 ppm (1980) must be reduced. Furthermore, while the current concentration of arsenic is 0.003-0.004 ppm (1980), benthons contain 5 ppm of toxic residues. Thus arsenic concentrations must also be reduced and not be allowed to increase. As for organic pollution, according to primary sea water standards, more than 100 tons could be added to the current daily COD discharge rate of 100 tons. Yet, when one considers the fact that red tides still occasionally occur in the bay even though industrial wastes have been controlled according to standards, increased COD discharge cannot, therefore, be permitted. Meanwhile, reference was made to the patterns of arsenic transport and distribution and threshold concentrations of lead, cadmium, copper and zinc--which like arsenic principally derive from the sulfur and iron residue from the Dalian Chemical Plant and are dissolved in the water--with respect to marine life, and studies were thereby conducted for these heavy metals' permissible discharge volumes and concentrations in the bay. The results of these studies indicate that, barring large increases in discharge, the industrial waste standards for pollutant (excluding oil) concentrations and discharge volumes are relatively safe with respect to water and bottom quality and marine life. The discharge standards for principal industrial pollutants in the bay are presented in Table 5.

Table 5. Discharge Standards for Primary Pollutants

Pollutant	Discharge Density (ppm)	Discharge Volume (tons/day)	Wastewater Discharge 10,000 tons/day
COD	100	112.3	
Oil	1.0	1.123	
Arsenic	0.5	0.562	
Lead	1.0	1.123	112.3
Cadmium	0.1	0.1123	
Zinc	5.0	5.615	
Copper	1.0	1.123	

Note: These figures are the standards if biological effect is ignored. If sediment transport is considered, then oil discharge density may permitted to increase to 5 ppm

Pollution Prevention Policy and Economic Results

In light of the issues raised by the investigation of the sources of pollution in and evaluation of the environmental quality of Dalian Bay, combined with consideration of current pollution levels and the environmental capacity of the bay, as well as present conditions in economic technology, control of the sources of pollution was made a key point of emphasis, and a pollution prevention policy premised on controlling discharge volume was established. Methods simultaneously employing investigation, evaluation, research and prevention have also been adopted. Those problems for which preventive measures can be implemented ahead of time have been given as much priority as possible, and there is no need to wait until all research is completed before conducting preventive work. Thus since 1979, the Environmental Protection Office under the State Council, the Liaoning Provincial Environmental Protection Bureau and Dalian City have issued control time tables for 86 projects, the emphasis of which lies on Dalian Bay. Many of these projects are already in progress and have achieved excellent results.

In order to prevent oil pollution, new waste treatment plants have been constructed, and old ones, renovated. For example, the Dalian Railroad Bureau completed waste treatment plants at Nanguanling and the Zhoushuizi Container Cleaning Station in late 1979; the waste treatment plant of the Seventh Dalian Petroleum Refinery added grit filtration; the port renovated and expanded existing equipment in its waste treatment plants; added flotation processes, oil retrieval ships and oil barriers; and recovered nearly 50,000 tons of oil in 1979-1980.

The Dalian Chemical Plant discontinued use of high-arsenic ores from Qingchengzi at the end of 1979. Thus the concentration of arsenic in the bay declined from approximately 0.02 ppm in 1979 to about 0.003 ppm in 1980.

We have consolidated 231 electroplating plants into 61 and adopted ion exchange, ferrous sulfate, active carbon absorption and electrolysis to treat heavy metal waste water.

The Second Dalian Gasworks installed secondary biochemical treatment equipment in 1980, and the Dalian Dye Plant has adopted neutralization, aeration, precipitation and active carbon absorption procedures to treat organic waste water. These measures have produced excellent results and progressively mitigated organic pollution in the bay each year.

The Dalian Chemical Plant intends to switch from wet to dry disposal for sulfur and iron residue, recycle its waste residue and build a pumping station to pipe its calcium chloride wastes to a disposal plant.

Because water quality has shown distinct improvement, the ecology of Dalian Bay has gradually revived. The shore around Siergou previously was covered with oily, black scum, but new green algae has appeared. On the shoreline reef adjacent to the Seventh Dalian Oil Refinery, which was similarly befouled, oedogonium and jingci zao [5449 0459 5679] have appeared. Kelp cultivated in the waters around Mianhua Island used to die off completely every year but now flourishes.

Prior to 1978, COD pollution necessitated construction of new treatment facilities. Thus urban construction departments planned an investment of more than 40 million yuan on this project, the first phase (the Chunliu Waste Treatment Plant) of which has already been completed. It is important to note, however, that in recent years organic pollution has been steadily reduced, especially through analysis and calculation of oceanic self-purification capability and environmental capacity. Thus it appears that the construction of waste treatment plants along the shores of the bay to treat COD is no longer urgent. If the project is reduced in size or the treatment process, simplified, the nation can save much money.

12431
CSO: 4008/28

TOXIC SPILL KILLS FISH IN FUJIAN

Fuzhou FUJIAN RIBAO in Chinese 19 Nov 83 p 1

[Article by Chen Changluo [7115 2490 3157] and Zhang Lixing [1728 4409 1840]: "A Toxic-Liquid Discharge From the Qingzhou Paper Mill Is Established As the Cause of the Big Fish Kill in the Min Jiang"]

[Text] The cause of the big fish kill in the Min Jiang has been discovered.

The report of the incident, which was carried in this newspaper, 6 November, aroused the concern of environmental protection, aquatic production and planning experts. The Fujian Urban and Rural Construction and Environmental Protection Department immediately ordered the Nanping City Environmental Protection Bureau to conduct tests of water samples and dead fish; and the department, together with other provincial agencies and the Nanping People's Government, jointly dispatched specialized and social investigators to the scene to get to the bottom of the matter.

The investigation has now established that this incident, one of the largest and most severe cases of pollution in the Min Jiang ever recorded, occurred during the evening of 3 November, when an equipment breakdown at the Qingzhou Paper Mill caused large quantities of black liquid and extremely toxic sulfate soap to be discharged. When this accident, for which the mill is liable for negligence, occurred, the mill leadership failed to take immediate emergency measures and to notify local environmental departments.

The investigative team reported that dead fish have been found everywhere on the surface of the river from Qingzhou to Eyang, a distance of 108 kilometers. The number of dead fish on the river bottom is unknown, but the largest retrieved from the surface weighed 65 jin. According to incomplete statistics from Nanping, cleanup work involved more than 3,600 people and retrieved over 30,000 jin of fish. Aquatic experts told reporters: "The spill caused a tremendous loss of adult and young fish and other aquatic life, nearly destroyed three major fish hatcheries and devastated aquatic resources, which will be difficult to restore in 3 or 5 years."

In the afternoon of the 17th, responsible comrades of the Construction and Environmental Protection Department, the Fujian Min Jiang Valley Planning and Development Commission and the Fujian Aquatic Products Bureau heard the investigative team's report and began studying ideas for handling the case in accordance with relevant provisions in the national Environmental Protection Law.

12431
CSO: 4008/77

NEW STEPS TO CONTROL BEIJING'S AIR POLLUTION

OW050842 Beijing XINHUA in English 0651 GMT 5 May 84

[Text] Beijing, May 5 (XINHUA)--New regulations on controlling air pollution came into effect in Beijing at the beginning of this month.

The 40-article regulations emphasize the reduction of smoke, dust, and harmful gas emitted by industrial facilities and motor vehicles.

According to the new ordinance, no new construction will be permitted in the city unless anti-pollution facilities are included in the projects.

Boilers and kilns must now have dust removers, and existing units emitting harmful gas above the prescribed level must be adjusted within a certain time, failing which they will be shut down.

Also banned are spraying lacquer and burning rubbish and noxious materials in the open air in the urban area.

In addition, three-wheeled motor vehicles, which cause serious air pollution, are to be systematically eliminated.

Penalties for violators of the new regulations are spelled out.

The Beijing municipal government allocated 400 million yuan (about 200 million U.S. dollars) for pollution control last year, or 20 percent of its total expenditure for capital construction and industrial technological upgrading.

By early this year about 900,000 resident households, representing 70 percent of the city's urban families, had switched from coal to gas fuel for cooking, and this has helped cut down sulphur dioxide emission, one of the worst pollution problems facing the city.

At the same time, most of the city's 12,000 coal-burning boilers have been renovated or fitted with dust removers.

As a result, air pollution has not been aggravated, although Beijing now uses three million tons more coal each year than it did a decade ago.

CSO: 4010/83

EFFECTS OF ACID RAIN ON AGRICULTURE DISCUSSED

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 4, 1983 p 24

[Article by Bian Ruixiang [0593 3843 4382]: "Acid Rain and Agriculture"]

[Text] In the 200 years since the invention of the steam engine, which started the industrial revolution, to the atomic age of the 20th century, industrial technology and economic development have brought us a rich material and culture life, at the same time it has brought us the industrial "three wastes" and pollution in agriculture, contamination of the air, water and soil and other environmental problems.

The combustion of coal and oil as the primary fuel in the world, emit a great amount of toxic gas each year. The United States each year releases 200 million tons of toxic gas into the atmosphere. In Japan, the amount of toxic gas over each square kilometer is as high as 32 tons. China burns 500 million tons of coal and tens of million tons of oil each year and releases 15 million tons of sulfur dioxide and 14 million tons of particulate matter into the atmosphere. Air pollution in China is serious, especially in cities with plants and mines. Five of the eight major environmental pollution incidents in the world were associated with air pollution.

Sulfur dioxide is a colorless and water soluble toxic gas that has a strong suffocating and irritating odor. Through the exchange mechanism of plant and atmosphere, hazardous substances in the atmosphere enter the plants and interferes with the function of the enzyme, kills cells and causes a host of plant disorders.

Sulfur dioxide remains in the atmosphere for 2-4 days. Reacting with water vapor at high altitude, it produces sulfuric acid or sulfuric acid fog and forms acid rain along with rain or snow.

In 1980, the acidity of rain (rainfall with a pH value less than 5.6) in Jiangsu Province accounted for 18.2 percent of the precipitation. In 1981 this increased to 30 percent and from April to July, 1982, the percentages were 66.7 in Suzhou, 83.3 in Changzhou, 11.1 in Wuxi and 9.1 in Xuzhou. The acidity of rain has been on the increase.

Acid rain's damage is great and it affects all the components of the ecological environment. Acid rain can destroy the protective layer of plant leaves, enter the pore and damage the grid structure in the leaves. It causes plants to wilt, slow down plant growth and may even cause plants to die.

At a phosphate fertilizer plant in Lianshui County, two consecutive sulfur dioxide and hydrogen fluoride compound pollution incidents occured on 22 July and 4 August 1982 in rainy and humid weather. The sulfur dioxide released became sulfur trioxide (SO_3) through oxidation and, at higher concentration, became sulfuric acid fog through photochemical oxidation. The acid fog filled the air and formed a pollution belt that ran 7 Chinese miles long. In the polluted area, 319.8 out of the 796.73 mu of rice suffered browning of the leaf tip and wilted, more than half of the 78.4 mu of cotton suffered flower and bud loss, leaves browned and fell off in the 81 mu of taro, 61.8 mu of soybean and from 2471 Italian poplars. Various degrees of damages were done to 20 mu of mulberry and 5.9 mu of vegetables. Watermelons planted by the Changqing commune in Suzhou have all died from acid rain.

Acid rain can also wash away nutrients in the soil, it may even completely rid the soil of nutrients. It increases the acidity of the soil, decreases the activity of the microbes in the soil and makes the soil poor.

Acid rain poses a direct threat to human. After the pollution incidents at the phosphate fertilizer plant in Lianshui County, 15 commune members nearby suffered from acid fog irritation, skin rash, itching, cough and asthma.

The Zhuma Commune in Lianshui County submitted the affected rice plants to the Jiangsu botanical bureau for analysis. The sulfur and fluorine contents were respectively 0.380, 0.715, 0.560, 0.654 ppm and 0.8, 28.8, 7.4, 6.5 ppm, all higher than normal.

Acid rain damages have been reported in Jiangsu Province, especially in industrial regions with a high consumption of coal. When the relative humidity is high, sulfuric acid fog is formed, which is 10 times more toxic then sulfur dioxide and damages plants. The responsible department should pay attention to the acid rain damage and take actions to install smoke and dust eliminators, improve the combustion method of coal and provide the city and town residents with liquified gas in order to reduce environmental pollution.

9698
CSO: 4008/42

EFFORTS TO REDUCE AIR POLLUTION IN SHENYANG

Shenyang LIAONING RIBAO in Chinese 22 Jan 84 p 2

[Article by Tong Yi [0157 3015] of the Shenyang Environmental Protection Bureau at the request of the editor of the newspaper: "Air Pollution in Shenyang is Being Controlled"]

[Text] The major air pollutants of Shenyang are smoke, sulfur dioxide, carbon monoxide, and nitrogen oxides, of which smoke pollution is most serious. This is created by the combustion of fuels, industrial tail gases, and exhaust from motor vehicles. According to relevant data, 75,000 tons of smoke is discharged as a result of fuel combustion in Shenyang annually, 86.6 percent comes from burning coal. 75,200 tons of sulfur dioxide is released by fuel combustion, and 84.5 percent comes from burning coal. Obviously, the air pollution in Shenyang is primarily caused by coal combustion. Such pollution is especially noticeable in the winter season because of the heating furnaces and small stoves in thousands of homes. The average daily coal consumption doubles that of the non-heating season. Fires are lit between 5-8 am and 4-8 pm. Moreover, there are more temperature inversion days in the winter and the barametric pressure is high, the pollutants can not diffuse easily. These factors aggravate pollution in the winter. According to monitoring results, particulates in the winter of 1982 was 1.17 mg per standard cubic meter, which is 3.9 times that of the national standard. The sulfur dioxide content was 0.328 mg per cubic meter, 2.19 times the national standard.

The leadership in the province and city is very much concerned about controlling air pollution in Shenyang. The Standing Committee of People's Congress in Shenyang officially approved "Temporary Measures to Control Smoke in Shenyang" in March 1982. In September 1983 the Standing Committee of the Provincial People's Congress passed the "Temporary Regulations on Smoke Control in Shenyang." In order to change the fuel composition, a coal gasification plant is being built on the northern outskirts of the city. It is estimated to produce 540,000 cubic meters of coal gas daily, which is capable of not only conserving energy but also improving the environment. It is expected to be in production by the end of this year. Power plants are used to produce heat and electricity in a centralized manner. The circulating hot water heating project at the Shenyang Power Plant which is capable of heating 2 million square meters, has been completed. In each heating season, 10,000

tons of coal can be saved, reducing 2,000 tons of smoke and 1,600 tons of sulfur dioxide. Various types of furnace accessories have been developed to provide heat. Presently, such heating systems have been realized in 263 locations, providing heat to 5,660,000 square meters of space. Old furnaces without smoke removal equipment are being modified. Units that severely pollute the atmosphere with black smoke were ordered to control it by a deadline. These measures are apparently quite effective.

Inspite of taking the measures mentioned above, which have a certain effect on eliminating smoke and dust, coal consumption has been increasing due to the rapid growth of industry in Shenyang in recent years, the population increase, oil burning furnaces switching to coal and the emergence of individually operated businesses. The amount of coal consumed in 1982 was increased by 880,000 tons as compared to that in 1978. Thus, the number of factors causing pollution is rising, and air pollution is more serious.

The city of Shenyang organized a special planning team to formulate a centralized heating system in order to accelerate the control of air pollution in Shenyang. After these plans are implemented, the present scattered, backward heating methods will be replaced. Air pollution in Shenyang will be basically controlled. The quality of the environment can be gradually improved year by year.

12553
CSO: 4008/154

MASSES COMPLAIN ABOUT AIR POLLUTION IN LANZHOU

Lanzhou GANSU RIBAO in Chinese 8 Dec 83 p 1

[Text] Since the beginning of winter, due to the high temperature, little wind, the thick inversion layer, plus the increase in the heating area and number of boilers, the discharge amount and the short supply of anthracite, and especially the slack of some units in ideological guidance and the little attention paid to the elimination of smoke and dust, the masses in Lanzhou commonly complain that the air pollution is very serious. According to the Provincial Environmental Protection Monitoring Station's sample monitoring of some key points on November 26-27, the highest average daily density of some hazardous substances in the air over Lanzhou City all exceeded the national standard. The residents of Lanzhou are disturbed by the increase in air pollution.

Responsible comrades from the provincial and city people's government and comrades from concerned departments went on the morning of 7 December to Qilihe, Binhelu, Huanghebei, Duanjiatan, Dongganglu, Huochedongzhan, Baiyinlu and some units to look into the matter.

On the afternoon of 7 December, the Provincial and City People's Government called together responsible comrades from various departments, bureaus, committees, offices and some responsible people of the economic entities in the city to listen to the Provincial Protection Bureau's briefing and analysis of the air pollution situation in Lanzhou City. The Standing Committee of Provincial People's Congress, and the responsible people of the Provincial and City People's Government gave briefings on boiler reconstruction and the elimination of particulate matter by the No. 1 Woolen Mill of Lanzhou and seven other units which they had inspected that morning, and mobilized all the units into immediate action to look into ways to eliminate smoke and dust, to popularize advanced experiences and to pay close attention to the renewal of equipment.

12369
CSO: 4008/104

BRIEFS

SHANGHAI AIR MONITORING SYSTEM--A city-wide air environmental hygiene monitoring system has now been preliminarily set up in Shanghai. The establishment of this monitoring system plays a positive role in promptly providing information about pollution throughout the city and for the study of health effects of air pollution. The Shanghai air environmental hygiene monitoring system is composed of the environmental hygiene monitoring stations and anti-epidemic hygiene stations of the city, prefecture and county. Throughout the city, there are 30 monitoring locations for stationary sources and 251 locations monitor particulates. [Text] [Beijing GUANGMING RIBAO in Chinese 13 Feb 84 p 1] 12380

CSO: 4008/193

STATUS, PROSPECTS FOR AGRICULTURAL ENVIRONMENTAL PROTECTION WORK

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 5, Oct 83 pp 1-3

[Article by the Environmental Protection Office of the Ministry of Agriculture, Animal Husbandry and Fisheries]

[Text] It has been exactly 10 years now since the First National Conference on Environmental Protection. Environmental protection work began 12 years ago with the organization of pollution investigations. In over 10 years, environmental protection work has gone through a process from new establishment to development. In commemoration of the 10th anniversary of the opening of environmental protection work in China, we have earnestly summarized the experiences and lessons of environmental protection work in agriculture over the past 10-plus years to promote further developments in the cause of strengthening environmental protection work in agriculture.

I. A Review of Agricultural Environmental Protection Work

Environmental protection work in agriculture began in China with pollution investigations and a focus on scientific research. An Agricultural Environmental Protection Research Laboratory was established in 1971 in the former Agricultural Biological Research Institute of the Academy of Agriculture and Forestry Sciences. From this point on, agricultural environmental protection work began to develop in an organized and planned way.

With impetus from the First National Environmental Protection Conference, investigations were begun in 1973 on agricultural environmental pollution in 20 provinces and municipalities. Later, large-scale coordination was organized among several tens of related scientific research units, colleges and schools to draft standards for farmland irrigation water quality, fisheries water quality, safe application of pesticides and other areas. At the same time, research was begun on biological purification of polluted water and on techniques for measuring trace and ultratrace amounts of toxins in soil, grain and other samples. In order to adapt to work requirements, it was determined to establish an environmental protection organization in the Ministry in 1976 to begin work in the area of environmental management.

The First National Symposium on Agricultural Environmental Protection was held in Zhuzhou in 1977 to discuss the principles, tasks and key work points

of agricultural environmental protection work and to make clear demands for the agricultural departments in each province, municipality and autonomous region to establish agricultural environmental protection management organizations or appoint specialists to be responsible for this work.

In 1977, an Environmental Protection Scientific Research Monitoring Institute was established in the former Ministry of Agriculture. This was the first specialized organization in China specifically involved in agricultural environmental protection research and monitoring. Over 10 monitoring stations were set up in several provinces and municipalities.

After the State Council issued its "Decision on Strengthening Environmental Protection Work During the Period of Readjustment of the National Economy" in 1981, we offered several opinions on strengthening environmental protection work in agricultural departments at all levels according to the conditions of environmental pollution and ecological damage in agriculture. Afterwards, the Second National Symposium on Agricultural Environmental Protection was convened. It conscientiously adhered to the spirit of the State Council document, summarized and exchanged experiences on environmental protection work, clarified the main tasks of environmental protection work in agriculture and discussed the "Regulations on Agricultural Environmental Protection Work" and the "Regulations on Agricultural Environmental Monitoring Work." Under the leadership of the Ministry of Agriculture, Animal Husbandry and Fisheries and the solicitude of the Chinese Agronomy Society, we also established the Chinese Agricultural Environmental Protection Society. From this point on, agricultural environmental protection work entered a new stage in China.

Following the development of environmental monitoring work in agriculture, two conferences of station heads of agricultural environmental monitoring stations have been convened since 1982 which clarified directions and tasks and studied questions of constructing monitoring stations.

In order to further implement the series of instructions and decisions of the Party Central Committee and the State Council concerning environmental protection work in recent years and implement the spirit of the National Symposium on Environmental Protection Work held in Nanjing in December of last year, we convened several agricultural environmental protection work report-back conferences from March to June of this year, earnestly studied the instructions of responsible comrades in the Central Committee and increased our knowledge of agricultural environmental protection work. The instruction of Comrade Hu Yaobang in his report to the 12th CPC Congress, "Resolutely safeguard all types of agricultural natural resources, and maintain the ecological balance," is the key strategy for agricultural development. Successful agricultural environmental protection work requires throwing off the narrow idea of the past of "taking pollution as it stands" and establishing a comprehensive viewpoint on protection of the agricultural ecological environment.

Currently, environmental protection work in agriculture has established a preliminary system for management, monitoring and scientific research work,

has gained some work experience, and has laid a preliminary foundation for creating a new situation for agricultural environmental protection work.

II. The Main Achievements in Agricultural Environmental Protection Work

In the past 10-plus years, agricultural departments at all levels have done a great deal of work in the area of agricultural environmental protection and attained the following successes:

A. Formulation of various environmental protection laws, regulations, rules and standards which have created the conditions for developing agricultural environmental management and monitoring.

The laws and regulations related to agricultural environmental protection which have been drafted or enacted by units and organizations connected with our Ministry in recent years include: "The Land Law," "The Grasslands Law," "The Fisheries Law," "Regulations on the Safe Use of Pesticides," "Regulations on Agricultural Environmental Protection Work," "Regulations on Agricultural Environmental Monitoring," and so on. Standards on agricultural environmental quality which have already been issued include: "Farmland Irrigation Water Quality Standards," "Fisheries Water Quality Standards," "Standards for the Safe Use of Pesticides," etc. Those which have already undergone examination and approval and are now being submitted for ratification are "Standards for Control of Hazardous Materials in Agricultural Sludge" and "Sanitary Standards for Chicken Feeds."

B. Development of environmental quality investigation and monitoring, preliminary understanding of agricultural environmental pollution conditions.

In the past few years, agricultural departments and scientific research units at all levels and agricultural environmental monitoring stations have put forth a total of over 160 findings and monitoring reports on agricultural environmental quality. After systematic analysis and arrangement by types, over 100,000 effective items of data were sifted through and selected. The first "Report on Agricultural Environmental Quality in China" was compiled on this foundation. It comprehensively analyzes characteristics and trends in agricultural environmental pollution in China, points out that the current spread of environmental pollution from a limited area to a large area and from cities into rural areas is a problem which deserves attention, and probes into appropriate policies for improving environmental quality. This year, the agricultural environmental monitoring stations in Beijing, Shanghai and Heilongjiang also published a trial "Report on Agricultural Environmental Quality" which provides a scientific basis for formulating policies on agricultural environmental protection, and which has been well-received by related departments.

C. Opening up scientific research, with a number of achievements.

In the area of pesticide residues, 66 control standards for safe use of pesticides have been proposed on the basis of research on residues of different pesticides on different crops. At the same time, research was done

on ecological control of toxins in pesticides and their effect on soil environments. In the area of irrigation with polluted water, research has been done on the movement and end destinations of heavy metals and aromatic hydrocarbon compounds in the agricultural environment which provided control standards for over 30 types of toxic and hazardous materials in sludge. In the area of fisheries, research has been carried out on toxic materials in aquatic organisms, especially on their accumulation and movements of residues in the bodies of fish which provided 34 control standards for fisheries water quality. In the area of research on soil background levels, preliminary measurements have been completed on the average abundance and residues of eight heavy metallic elements in primary agricultural soil types and grains in some provinces and municipalities, and a foundation has been laid for research on background levels of pollutant elements in the soil of natural agricultural zones in nine provinces and municipalities. In order to integrate scientific research with production practice, scientific experiment bases were set up by the Zhejiang Agricultural University in Xiaoshan County, Zhejiang Province, and by the Ministry's Environmental Protection Scientific Research and Monitoring Institute in Shijiazhuang, Hebei Province and other areas to carry out systematic observation and experimental research on pesticides and water pollution.

D. Establishment of a monitoring structure, with development of agricultural environmental monitoring.

The Ministry's Environmental Protection Scientific Research and Monitoring Institute has been initially completed and will gradually become the national center for agricultural environmental protection monitoring. Apart from the more than 10 agricultural environmental monitoring stations which have now been set up in provinces, municipalities and autonomous regions, the Sixth Five-Year Plan proposed the establishment of agricultural environmental monitoring stations in more than 10 additional provinces, municipalities and autonomous regions, including Shaanxi, Nei Monggol, Hebei, Tianjin, Jiangsu, Qinghai and other areas. Many colleges and universities, agricultural scientific research academies and institutes, and other related research units have entered the realm of agricultural environmental protection from the scope of their own disciplines. This combination of special research methods and multiple disciplines is now promoting the development of research on agricultural environmental protection.

E. A focus on education and training, training for a group of key professionals.

Zhejiang Agricultural University has established an Environmental Protection Department which already has two classes of graduates, Beijing Agricultural University is now preparing to set up a specialization in environmental protection, and a number of agricultural colleges and schools have begun classes in environmental protection outside the environmental protection specialization. Teaching materials on agricultural environmental protection have been published on a trial basis. Over the past few years, beginning with the Ministry and on down to provinces, municipalities and

autonomous regions, a total of 22 cadre training classes of various types have been run and the agricultural departments of some provinces (and autonomous regions) have set up systems for environmental protection cadre training with fixed schedules. There have been obvious benefits.

F. Development of domestic and foreign academic exchanges, promotion of the development of environmental protection science and technology.

Since 1979, we have sent people abroad for observation and cooperative research, and have arranged for and received foreign scholars to come to China for observation and lectures. After the Agricultural Environmental Protection Society was founded, it not only organized specialists to actively undertake many types of academic activities and scientific investigations, but also began publishing the magazine AGRICULTURAL ENVIRONMENTAL PROTECTION. This vigorously promoted the development of the agricultural environmental protection services and the dissemination and popularization of knowledge. The Agricultural Environmental Protection S&T Information Network was founded in March of this year to further strengthen the exchange of intelligence and information.

G. In the area of protection of the agricultural ecological environment, quite a bit of work has been done in promoting development of methane and other renewable resources, and in experiments on extension of biological prevention technologies and other areas as a result of mutual coordination by related units. Particularly in the past few years, responsible comrades in the Party Central Committee and the State Council have repeatedly stressed that there should be major efforts in the northwest and other regions for planting trees and grass, widespread afforestation and other measures to restore ecological balance. The rural areas and pastoral regions have responded warmly and there has been a profound influence on protecting the agricultural ecological environment.

III. Current Problems and Ideas for the Future

Although a certain degree of success was achieved in environmental protection work in the past, there are still many difficulties and problems. The main ones are: agricultural environmental protection work has not yet formally come under state economic planning; managerial and monitoring structures are incomplete, there is a shortage of technical personnel, and scientific research and monitoring facilities are backward; channels of construction capital and sources of funds are blocked; the phenomenon exists of unclear responsibilities, tasks and divisions of labor between departments, resulting in omissions and repetition, low efficiency and much waste. In summarizing the experiences and lessons of agricultural environmental protection work, we deeply realize that better work must be done in the following areas:

A. Improve knowledge, clarify the guiding ideology of agricultural environmental protection.

Although agricultural environmental protection work in China has undergone repeated propagandization and education and the knowledge of the broad cadres and masses has been substantially increased, there are still a substantial number of cadres who have insufficient knowledge of this issue and do not give it enough attention. This requires further resolution. The broad mass of cadres must come to understand that the guiding ideology of agricultural protection work is to promote economic development and serve agricultural modernization. Good work in agricultural environmental protection will not only benefit the development of agricultural production, but will also play an obvious role in achieving the overall goals of quadrupling the total value of agricultural production by the end of the century and achieving stable high output. Thus, we must actively concentrate on protection of resources and the agricultural ecological environment, turn vicious cycles into beneficial cycles and cause agricultural environmental protection to be increasingly advantageous for the development of production.

B. We must truly bring environmental protection work into national economic development planning.

This is the key to achieving coordinated development of economic construction and environmental protection. Agricultural departments at all levels must include norms and requirements for protection of the agricultural environment such as structural readjustments in the agricultural economy, protection and rational utilization of agricultural natural resources, prevention of pollution in commune and brigade enterprises, rational application of pesticides and chemical fertilizers, and so on, in their plans in related areas, and must also make concrete decisions when they are formulating development programs and plans. Second, plans should also include construction of environmental monitoring stations and networks, development of agricultural environmental quality evaluation and construction of experimental bases for comprehensive agricultural environmental management.

C. We must establish a vigorous work system to exercise monitoring, supervision and inspection.

The task of agricultural environmental management is to inspect and supervise all types of human activity which pollute the environment or damage the ecological environment, and furthermore, to adopt measures for prevention. Agricultural environmental protection organs must be given the authority to carry out supervision and investigation if they are to be able to assume the heavy burden of protecting the environment.

D. Give attention to investments in knowledge, develop agricultural environmental protection education and cadre training.

Along with running environmental protection specializations in agricultural colleges and universities and various types of cadre training classes, we must also actively popularize knowledge on agricultural environmental protection. China has a rural population of 800 million living over a broad rural area and their activities have an enormous impact on the agricultural

ecological environment. An important question which cannot be neglected is how to publicize and make them clearly understand the relationship between developing agricultural production and protecting the ecological environment, and to understand a bit of relevant scientific knowledge. This question must receive the attention of leaders in agricultural departments at all levels. To begin work in this area, we must give full play to the role of the Chinese Agricultural Environmental Protection Society, continue to do good work in publishing the magazine AGRICULTURAL ENVIRONMENTAL PROTECTION, encourage qualified personnel to publish scientific popularization materials on agricultural environmental protection that are designed for rural needs and popularize knowledge on environmental protection to the rural cadres and peasant masses to form a new practice of having everyone feel responsible for agricultural environmental protection.

In order to quadruple the total value of agricultural production by the year 2000, agricultural environmental protection must: formulate and implement suitable rural technological and economic policies; readjust the structure of the agricultural economy and establish a favorable agricultural ecological environment; strictly control pollution from commune and brigade enterprises, and restrict the movement of polluting industries from urban to rural areas; resolve rural energy problems; control pollution from pesticides and chemical fertilizers, accelerate the development of science and technology for agricultural environmental protection and other measures. To achieve these goals, the top priority is to earnestly strengthen leadership of environmental protection work in agricultural departments, make concrete arrangements from planning to organization, truly make agricultural environmental protection work an important order of the day and strive to create a new situation in agricultural environmental protection work.

12539
CSO: 4008/88

'ECOLOGICAL AGRICULTURE' SEEN IMPORTANT IN FUTURE PROTECTION

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 5, Oct 83 pp 4-7

[Article by Mai Yongbin [6314 3057 1755] of the Environmental Protection Scientific Research and Monitoring Institute of the Ministry of Agriculture, Animal Husbandry and Fisheries: "Preliminary Thoughts on Important Tasks Facing Agricultural Environmental Protection in the Future"]

[Text] In the past several years, agricultural environmental sciences have come to receive increasing attention from the state and the broad masses of people. This is due to the fact that the agricultural environment is the material foundation of which mankind depends for its existence. This is especially true in a country like ours with a large population, 80 percent of which is rural. The relationship of the people to the agricultural environment is obviously important and close. Beginning in the 1970's, we began paying attention to the importance of protecting the agricultural environment, and began carrying out a great deal of investigation and research work, with much success. Over the past decade and longer, however, the focus of our investigation and research has emphasized the industrial "three wastes" and pollution of the agricultural environment by farm chemicals, as well as environmental problems caused by this pollution. In other words, our past research work was in the realm of the ecology of pollution. This was completely necessary at that time because the pollution was very dangerous to people, and the degree of danger was extremely serious in certain regions.

After the 12th CPC Congress, the Party Central Committee put forth the magnificent goal of struggling to quadruple the total value of industrial and agricultural output by the year 2000. How can we do good work in agricultural environmental protection in this important historical period and make it better serve the construction of the "four modernizations"? What are the major tasks facing agricultural environmental protection in the future? These are questions that urgently await research and resolution.

Based on the practice of those of us who have been involved in agricultural environmental protection work over the past decade and longer, it is far from enough to merely concentrate on research on pollution ecology. We must

also give attention to the question of the entire natural ecological environment. Close attention has been paid to "ecological agriculture" by related domestic and foreign specialists in recent years, which is possibly a useful measure for resolving national ecological problems.

Specialists who advocate developing "ecological agriculture" oppose "high import" agriculture (highly intensive agriculture) as currently practiced in some developed countries which involves large applications of chemical fertilizers, pesticides, herbicides and other chemical materials as well as utilizing large amounts of petroleum energy in exchange for farm and animal products. They feel that "high import" agriculture is in reality an administrative form which plunders the soil through intensive use with little improvement. If this road of development is followed, soil fertility will become increasingly barren and the soil structure will be severely damaged. Moreover, following increased resistance to chemicals by diseases and insects, there must be continual increases in the amounts of farm chemicals, antibiotics used for livestock disease prevention and other medicines used. The result is inevitable contamination of farm and animal products and damage to the agricultural ecological environment. At the same time, the current energy shortage has become a major world problem. From just this point, it can be seen that the road of "high import" agriculture is one that cannot be taken over the long term.

What is "ecological agriculture"? There is no single version. Some say there are 7 basic conditions, while others say there are 10. In the overall view, however, the so-called "ecological agriculture" refers to developing agriculture from the ecological viewpoint. It can also be said that the development of agriculture does not just concern agricultural production itself, but should also give consideration to the surrounding environment, especially to using and maintaining an ecological balance in the agricultural environment. The basic measures involved in "ecological agriculture" are: using green manure plants to make nutrients using solar energy for nourishing plants themselves which serve as feed for animals, with the manure and urine of the animals serving as nutrients for plant growth. With such a reciprocating cycle, mankind can obtain clean and nutritious animal and plant materials.

"Ecological agriculture" is a form of self-sustaining "low import" agriculture which is the opposite of "high import" agriculture. It basically does not use chemical fertilizers, pesticides, herbicides and other chemical materials, but instead relies mainly on energy transformation and recycling matter during the production process to develop agriculture, animal husbandry and fishery. For example, crop stalks and leaves are used to feed livestock whose manure and urine are used to raise fish, with the sludge from fishponds serving as fertilizers; or, mulberry leaves are used to raise silkworms, the silkworm excrement is used to raise fish and the sludge from fishponds serves as fertilizer for mulberry trees; or, the sludge can be used as fertilizer for sugarcane, the sugarcane leaves are used to raise fish, creating "mulberry-based fishponds" or "cane-based fishponds." Mulberry and cane-based fishponds have a history of several centuries in

Guangdong's Shunde County. Although they were destroyed for a period of time, they have now been restored, have received attention from home and abroad, and have become a good model for everyone to study. Later, some people also developed methane generation using livestock waste, and the methane serves as a clean source of energy (it is predicted that methane will provide 40 percent of all the rural energy used in China by the year 2000). It can be used for lighting, generating electricity, heating water, etc. After generating methane, the solid wastes can be used in agriculture as an excellent organic fertilizer. Most recently, some comrades of the Conservation Office of the Urban Construction Bureau in Shijiazhuang City have envisaged using sludge to raise earthworms which are used to raise chickens, which are then used to raise martens. The earthworms are themselves a high-protein material, and the martens are a valuable fur animal; they are trying to eliminate harmful components of the sludge during the process of raising earthworms in the sludge. If the experiments are successful, this method can become a better way to deal with hazardous sludge. There are also many other methods.

As for the question of preventing diseases and insect pests, those involved in "ecological agriculture" mainly adopt non-chemical means and emphasize prevention. Apart from adopting biological prevention (i.e., using bacteria to control bacteria, insects to control insects, bacteria to control insects and other methods which make use of "natural enemies") and integrated control measures, there are some agricultural techniques which are beneficial for preventing diseases and insect pests, such as interplanting, close planting, intercropping, etc.

Some people now consider "ecological agriculture" to be a new model for developing modernized agriculture. Looking at the actual conditions of existing "ecological agriculture" operations at home and abroad, it is quite possible that this model can become one of the main directions for the future development of agriculture because using this method to manage agriculture can reduce pollution of the environment, maintain soil fertility, lower production costs and produce high-quality farm and animal products. Especially in Third World countries, this agricultural production pattern is potentially of even greater vitality and is an even broader developmental path. The peasants of China have accumulated extremely abundant farming experience through the struggle for agricultural production over thousands of years. The traditional patterns of agricultural activity in China are highly similar to the "ecological agriculture" of today. For this reason, we definitely have the conditions for developing "ecological agriculture." The "ecological agriculture" advocated by many foreign specialists has many shortcomings, and is generally suitable to a scale of tens, hundreds or even thousands of mu. This is of even greater significance for developing "ecological agriculture" following the current trial implementation of the "household contract responsibility system" in China.

I feel that, while doing research on the planned development of "ecological agriculture" in China, we must first of all earnestly summarize the domestic and foreign experiences of the past and select the most superior model from all the different types and categories. Moreover, we should start with

research on an ecological village or town, beginning with a natural village or town and later expanding to a commune, a county, a prefecture, a province, a large region and on to the entire nation. [Sentence partly illegible due to damaged document--the author proposes the development of "ecological agriculture" on state-run crop and livestock farms.]

It should be noted that development of "ecological agriculture" definitely cannot be done indiscriminately or simply using one or two models. We must create many types of models according to local conditions, based on the national situation in China and the natural conditions of each region. There are, for example, ecological models which give primacy to agriculture, forestry, animal husbandry or fisheries, etc. In addition, I feel that the "low import" agriculture mentioned by foreign ecological agricultural workers which does not use chemical fertilizers, pesticides or other farm chemicals should not be taken too absolutely. Given China's current conditions, we should still use chemical fertilizers and pesticides, and can only strive to reduce the amounts used.

The above was a brief discussion of the good points and developmental prospects of "ecological agriculture." However, a single thing always divides into two. We definitely cannot look upon "ecological agriculture" as a panacea. It certainly cannot resolve all of the problems of agricultural production, and is definitely not the only road for agricultural development in the future. It is entirely different from a grand scheme for "national renovation." It cannot be denied, of course, that "ecological agriculture" can be an important part of national renovation, but it is not the entirety of national renovation. If it is said that national renovation keeps the general goal in sight, then "ecological agriculture" takes the daily tasks in hand. A good beginning for the latter can be the best route to resolving ecological problems in China.

The main point here is that "ecological agriculture" is a question which is just now being discussed and studied. It appeared following the summarization of the experiences and lessons of "high import" agriculture in developed countries. There is, however, a common shortcoming to the current models of "ecological agriculture" proposed by everyone. This is the isolation of the agricultural ecosystem from the natural ecosystem, the semi-natural ecosystem and the urban ecosystem. It independently pursues good cycles of energy and matter within the agricultural ecosystem and simply treats the import of energy and matter from outside as a dangerous element. The actual results of this can be obstruction of the application of modern technology in agricultural production, and it does not conform very well to dialectics in ideological methods. [Sentences illegible--author mentions that Engels advocated integration of urban and rural areas, then discusses the necessity of linkages between the agricultural and other ecosystems.] Development of the environmental sciences can help us avoid blind scientific relationships and flows while achieving scientific and highly effective relationships and flows. Therefore, we must continue to discuss and study, absorb the positive elements of ideas on "ecological agriculture" from each country, eliminate the negative elements and develop China's own road to

"ecological agriculture." That is to say, the model for developing "ecological agriculture" in China should combine Chinese and Western forms, and definitely cannot be a simple importation of Western models.

In summary, I feel that workers in agricultural environmental protection in China should continue to engage in research on pollution ecology in the future. I predict that this will still be an important task for us in certain matters in the future because our agricultural environment still suffers from severe pollution. Moreover, based on the current conditions of industrial and agricultural production in China, pollution from the industrial "three wastes," farm chemicals and other sources will not decrease in the short term. In the long run, however, we must leap out of the small circle of pollution ecology and begin doing research on "ecological agriculture." Furthermore, we must take a broader view and open up larger, nationwide work on protection of the natural ecological environment. This is an important future task facing workers in agricultural environmental protection--the gradual movement from research simply on pollution ecology to research on "ecological agriculture" and protection of the natural ecological environment. We certainly must transform the present passive situation into an active one and turn vicious cycles in the ecosystem into beneficial cycles.

The West German government has pointed out that attention should be given to both developing production and protecting the ecological environment. Whenever there is a contradiction between the two, it is better to sacrifice production and protect the ecological environment. While we were in West Germany making investigations we clearly saw that they pay utmost attention to work for protection of the natural environment throughout the country. They have, for example, formulated a "land restoration" policy which has been outstandingly effective in the area of protection of the ecological environment. "Land restoration" requires those who damage the land (regardless of the reason for the damage, such as opening a mine, etc.) must give prior written guarantees that the original features of the land will be restored within a limited period of time. The land cannot be disturbed when there are no earnest guarantees, and the decision-making power is in the hands of the Ministry of Agriculture and Forestry. We personally saw the pits of lignite mines which had already become fertile farmland, forests, scenic regions or convalescent land. This is a good reference for us.

If we wish to undertake large-scale work for protection of the natural ecological environment in the future, there must first of all be comprehensive planning on a national scale according to the natural conditions and special characteristics of each region to designate the proportions of land to be given over to agriculture, forestry and animal husbandry, to prohibit the cutting of forests to make farmland and reclamation of grasslands, creating farmland on hillsides or around lakes, etc., in order to prevent soil erosion and granulation, and to stop further deterioration in already damaged ecological environments. At the same time, we must prohibit the excavation of dirt for making bricks, tiles and other construction materials, the occupation of cultivated land for building houses in rural areas and other erroneous actions. The state has now made protection of cultivated land a fundamental national policy. This is extremely important. As everyone

knows, land is incapable of being regenerated. China now has an average of 1.5 mu of cultivated land per person, equal to only 27 percent of world average per capita land. We must continue to live on this limited amount of land for generations to come. Therefore, we must protect every inch of land just as we protect our eyes.

Forests play an extremely important role in regulating the climate, conserving water resources, stabilizing soil and sand and maintaining the natural ecological environment. For this reason, every nation of the world competes to develop and protect forests and strives to expand the area covered by forests. Countries which are relatively advanced in this area have a forest cover area as high as about 70 percent, but the area covered by forests in China is only 12.7 percent of the total national area, which means that ours is among the countries having the lowest forest cover percentage. According to data which have been presented, forests must cover 30 percent of the nation's area before the goal of reducing natural disasters can be reached. We should forge ahead toward this goal and achieve a forested area equal to at least 20 percent of the national area before the year 2000. Of course, the relationship between the forest cover percentage and natural disasters is not an absolute one since changes in atmospheric circulation have a relatively important position.

Grasslands are the foundation for development of animal husbandry. There is a line in an ancient Chinese poem: "The wind blows the grass low and one can see the cattle and sheep." One can see that in the past the pastoral regions of China had abundant grass and sturdy livestock, with beautiful landscapes. Grasslands not only serve for breeding livestock to meet the living needs of mankind, but can also play a role in stabilizing soil and sand, preventing soil erosion and beautifying the environment. According to data which have been presented, China has a grasslands area of 1.2 million square kilometers, equal to 12.5 percent of the total national land area. An additional wilderness area of 1.92 million square kilometers makes a total area equal to 32.3 percent of the national area. This is enormous wealth. Although there are few high-quality livestock farms and the greatest portion is still not suited to grazing livestock, there is a great potential for developing animal husbandry if it is transformed. In the area of future protection of the environmental ecology, how to do good work in transforming grasslands and wilderness areas, especially transformation of grasslands, should become the order of the day.

In summary, agricultural environmental protection work is an important component of work on nationwide environmental protection work as a whole, and touches on an extremely broad area. The above is only based on a bit of experience from one person's involvement in agricultural environmental protection work for over a decade. I have offered some simple viewpoints on the important tasks facing agricultural environmental protection work in the future. They should be discussed with specialists and comrades involved in agricultural environmental protection work.

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REVIEW, PROSPECTS FOR AGRICULTURAL ENVIRONMENTAL PROTECTION

Tianjin NONGYE HUANJING BAOHU [AGRICULTURAL ENVIRONMENTAL PROTECTION] in Chinese No 4, 1983 pp 7-10

[Article by Zhou Lefu [0719 2876 4395] and Qu Zhongxiang [2575 0112 3276] of the Department of Biology, Yunnan University: "On Agricultural Environmental Protection"]

[Excerpt] Present Status and Problems in Agricultural Environmental Protection in China

Since the founding of the PRC, extensive capital construction in agriculture has been underway and a series of measures to develop agricultural production have been adopted, which has led to rapid recovery and growth in agriculture. Agriculture, forestry, livestock breeding, sideline production, and fishery have grown to varying degrees. Statistics show that the total output value of agriculture in 1979 was 2.7 times that in 1949. [In 1979] the total output of grain was 664.2 billion jin, a 1.9-fold increase [over 1949]; the total output of cotton was 44.15 million dan, a 4.0-fold increase; the total output of oil-bearing crops was 128.71 million dan, a 1.5-fold increase, and the total output of sugar crops was 492.27 million dan, a 7.7-fold increase. In livestock breeding, the year-end inventory of large animals was 94.59 million heads, a 58 percent increase [over 1949], the year-end inventory of pigs was 319.70 million heads, a 4.5-fold increase and the year-end inventory of sheep was 183.14 million heads, a 3.3-fold increase. The production of aquatic products was 4.31 million tons, an 8.6-fold increase, the value of forestry products was 4.5 billion yuan, a 17-fold increase and the value of subsidiary crop production was 23.9 billion yuan, a 13.1-fold increase. In the meantime, China has built extensive flood prevention, irrigation, drainage and power generation facilities, the effective irrigated area has reached 675.05 million mu which accounts for 45.2 percent of the total arable land. Furthermore, the agro-ecological environment of many areas has also improved considerably; for example, after an effort of 8-10 years of comprehensive control, the Linshan commune of Yanting County in the hilly area of central Sichuan has broken a viscious cycle and made a series of changes favorable to the ecological balance.

(1) Changes in forestry:

After planting alder and cypress hybrid forest on the grassland for 3-5 years, the canopy density reached 0.6-0.9 and local weather began to change. Measurements made during the 1978 arid period showed that, when the forest coverage was 35-40 percent, the relative humidity in the field 200 meters away was greater than 60 percent and the occurance probability was 72 percent. But when the forest coverage was 15-20 percent, the relative humidity was only 50 percent. There were also large changes in the composition of the ground-covering vegetation under the trees, Gramineae plants were gradually replaced by hygrophilous plants such as ferns and rose. Even Gramineae plants such as white cogongrass and suocao [5560 5430], which normally bloom and seed in July or August when grown in the grassland, did not bloom until November and bore no seed. Their leaves turned tender, the edible part increased and the quality improved. The total grass output of Linshan commune was comparable to other grasslands in the county and did not suffer much reduction. The number of animals increased in the forest and the increase of cowbirds, wood larks, wild rabbits, weasels, and badgers has eventually led to new links in the food chain in the area.

(2) Changes in soil:

Field and soil improvements changed the appearance of the surface soil and the liberal application of alder leaves also changed the quality of the soil. The annual output of fresh leaves of the commune was 3.37 million kilograms. According to a survey of four typical brigades covering an area of 671 mu of crop land, 100,600 jin of fresh alder leaves were used in the spring of 1980 and 1,000-1,500 jin of dried alder leaves were used in the winter. Each mu of irrigated land used 1,000-1,500 jin (fresh weight) of alder leaves, which was equivalent to 120-180 jin of standard nitrogen fertilizer in arid field or 40-60 jin in paddy fields. It was discovered in sectional analysis of soils made during a 1980 soil survey of three typical communes in the southern, northern and central (Linshan) parts of the county that the content of carbon, nitrogen and other effective nutrients in Linshan commune was higher than that in Bozi commune. The organic nutrient content was 1.13 percent higher for paddy fields and 0.27 percent higher for arid fields.

(3) Supply and demand of agricultural water:

Besides retaining water by afforestation, the Linshan commune also paid careful attention to water management, allocated water annually according to region and developed the potential of surface water and groundwater. Plans for acquiring and using water and supply and demand were basically balanced.

(4) The overall ability of the ecosystem to resist natural disaster was improved:

The improvement of the resistance of the ecosystem ensured the normal progress of material recycle and energy conversion. The ability to store water and transfer water allowed the integrated use of surface water, groundwater, soil

water and forest water. Enduring three consecutive years of drought from 1977 to 1979, grain output reached its highest record in 1977 and the flood-resistance ability performed outstandingly in the large flood of 1981. In 12-14 July 1981, a storm centered on Yanting County dropped 306 mm of rain in Linshan commune. A second rainstorm from 1-3 September dropped 293 mm of rain. The flood water modulus in repaired ditches in Linshan commune was 4.1 to 14.4 percent less than that in the first brigade of Jingluo commune. Compared with its other two ditches, the north ditch of Linshan commune did not perform as well in dissipating the flood crest because it has a poorer forest cover and measures to retain water were few and dispersed. This showed that regulation of the structure of the system and the interplay of factors improved the ability to resist natural disaster. The effects of improved water and temperature conditions on material recycle and energy conversion have been well known.

(5) Improvements in crop and production force

Crops and vegetation are the central components of the farm ecological structure, their evolution is mainly manifested in the adjustment of crop structure and composition, and the improvement of function and increase of the biomass, especially the part pertaining to human needs. Due to improvement in water, fertilizer and soil conditions and local weather, the area of rice paddy in Linshan commune has increased from 279 mu in 1979 to 1577 mu. A multiple-cropping rotation system of wheat, corn and Chinese trumpet creeper has been established on the arid land. The rotation system lacked green fertilizer for winter crops and beans for fall crops. The forest ecosystem provided feed (vine leaves) and fuel (stalks), developed animal breeding, improved material recycle and formed a system that combined agriculture, forestry and livestock breeding and supplemental farm land with mountain resources.

In terms of biomass, production per mu in Linshan commune has been well above the county average since 1976. Whether it was in the arid year of 1979 or during the great flood in 1981, the grain production per mu in Linshan commune has increased more than the county average. Production in 1981 was 3.5 percent higher than that of 1980 and the margin of increase (1-4 fold) was even greater after the production responsibility system was put into effect.

As an agro-ecological system, the Linshan commune has obtained good results in regulating ecological and environmental factors, and gradually turned around a viscious cycle; its distinguishing features are: (1) a relatively stable structure and production, the ability to endure natural disaster and a self-regulating ability; (2) constant replenishment and accumulation of controllable material and energy in the ecosystem; (3) a balance in supply and demand of the main factors in the ecosystem and stability in production, material resources, energy and disaster resistance ability. The commune has become an embryonic model of ecological balance.

The numerous models of ecological balance in China have ensured a steady increase in the gross value of agricultural production over the past 30 years and have been the main reason for agricultural development in China year after year.

But in the past 30 years, many areas lacked an understanding of the importance of using natural resources wisely, "impractical directions" have violated the laws of nature and economics and to various degrees robbed the agricultural natural resources, disrupted the ecological balance and caused a decline in resources and started a viscious cycle in agriculture. This predatory style of management has the following characteristics:

In crop planting, it leads to shortages in grain, destruction of forests, decline in livestock breeding, inapt reclamation of land from lakes and the sea, low yield and wide planting and using the land heavily without cultivating it.

In the utilization of forest resources, it depletes and even exhausts the resources by destroying forests, and by unplanned reclamation and excessive logging. For example, 30 years of development has decreased the reserve of the Yichun forest in Xiaoxinganling by 160 million cubic meters, which is 40 percent of the original forest reserve. The depletion of forests in south China is even more serious. In 1979, the consumption of forest resources in Sichuan and Yunnan exceeded the annual growth by 11 million and 12 million cubic meters respectively. Extensive timber production beyond the state plan has increased the depletion rate of forest resources to 4-5 times that of the production plan. For example, the Heibaishui forest in Yunnan was supposed to provide 100 years of logging, but in less than 10 years it is almost depleted. Cut over kept expanding and afforestation was falling farther and farther behind. Afforestation efforts only emphasized quantity and not quality, poor management has resulted in a low survival rate and forests were used heavily and inadequately replenished.

In the livestock breeding on the grassland, because of overpopulation, breeding has relied on nature. Fishing was also unplanned and very little was done in hatching. Such problems began to emerge in the late 1950's and the situation has deteriorated since then with disastrous effects. The forest cover kept on shrinking year after year. The area of soil erosion is now greater than the 1.5 million square kilometers during the initial post-liberation period. Heavy rain damage increased year after year, the productivity of the land declined and another 40 million mu of land has turned into desert in the last 15 years. The area of degraded grassland has reached 770 million mu or 23 percent of the usable grassland area. Furthermore, because the protection of water resources has been neglected, water pollution is very serious. Main branches of the seven large rivers in China and lakes have all been polluted to various degrees, affecting industrial and agricultural production and endangering human health. Immediate attention is needed. We shall use the following example to stress the point. Yuanyang County in Honghezhou, Yunnan Province, used to have 800,000 mu of forests and good mountain land, but due to indiscriminate logging and misuse of the forests in recent years, the forest area has steadily decreased to 210,000 mu in 1973. The cover rate of mature forests has decreased from 24 percent to 7 percent, surface runoff has increased, soil productivity has decreased and the ability to conserve water has decreased. Measurements showed that the minimum flow rate of the 29 rivers flowing through the county suffered a 31-34 percent

decrease from 1964 to 1974, and over 230 locations on the largest river, Longtanxigou, have totally dried up. The decrease in water volume has gravely affected agricultural production and the people's livelihood, and it has become increasingly difficult to provide the people and the livestock with drinking water. This example showed us how important and urgent the protection of the agricultural environment is.

Proposals to Protect and Establish a Sound Agricultural Environment

Looking back on China's agricultural development and changes in the agro-ecological environment over the past 30 years, we should learn from our experience and the benefits derived from following the laws of ecology and the lessons learned from violating the laws of ecology. We should study trends in foreign countries in the last 10 to 20 years. Our view is that the sound tradition of China's agriculture should not be abandoned, energy-intensive agriculture should be avoided and the laws of ecological balance must be followed.

(1) To protect and establish a good agro-ecological environment, we should follow the theory of agro-ecology.

The agricultural ecological balance, the development of agricultural production and the protection of the agricultural environment should be systematically integrated. First we must have an overall plan based on local conditions and adjust the ratio of agriculture, forestry and livestock breeding. We should begin by regulating the ecological factors to improve the agricultural production conditions and establish a strong material and energy conversion system.

(2) Starting from an ecological viewpoint, we should adjust the internal structure of the farming activity, enlarge the planting area for soybeans and heed the sound Chinese traditional, agriculture of maintaining the ecological balance of the farm land by combining nurture and usage.

China's gross production of grain and soybean in 1980 was basically equivalent to that of the U.S. in 1978, both were approximately 320 million tons. China's cotton production of 2.7 million tons was slightly more than the 2.36 million tons of the U.S. The amount of nitrogen fertilizer (pure nitrogen) used was 10.4 million tons for the U.S. and 9.99 million tons for China. Together with imported nitrogen fertilizer, China used as much fertilizer as the U.S. did. However, the composition of food production in the U.S. was 273.35 million tons of grain including 48.95 million tons of wheat, 6.25 million tons of rice, 179.89 million tons of corn, 50.15 million tons of soybean and 38.95 million tons of other grain; the composition of China's food production was 139.26 million tons of rice, 54.16 million tons of wheat, 27.58 million tons of tubor crops, 89.08 million tons of corn and sorghum and 7.88 million tons of soybean. Based on these figures, there were 48 million tons of protein in the U.S. production and 25 million tons in the Chinese production, 52 percent that of the U.S. Protein accounted for 15 percent of the U.S. food nutrition and only 7.8 percent of the Chinese diet. In the U.S.

soybean protein was 42 percent of the grain protein but it was only 12.6 percent in China. Applying the same amount of nitrogen fertilizer, there was such a wide difference in protein production.

This discrepancy demonstrated a serious imbalance of the nitrogen cycle in China's agriculture. There were three reasons for it, the first was the imbalance between the production of chemical fertilizer and the usage of nitrogen, phosphate and potassium fertilizers. A shortage of phosphate and potassium has lowered the effectiveness of nitrogen fertilizer. The second reason was the low production of soybean. Soybean and other bean crops for many years have been labeled low yield crops and as a result China, the homeland of soybean, turned into an importer of soybean and soybean oil. In terms of source of the nitrogen cycle, China added industrial fixing of nitrogen, but abandoned the planting of soybean and handicapped agriculture. The third reason was the practice of stalk burning. Without large animal manure, the organic content of the soil decreased and the producing ability of the soil was seriously degraded. Combined with the liberal use of chemical fertilizer, this has become a viscious cycle. It is now time to deal with the problem from an ecological balance point of view. The agricultural development of Linshan commune in Yanting County in the hilly area of central Sichuan represents a new prospect for traditional Chinese agriculture. The Linshan experience is a good example of maintaining the balance of the agro-ecological environment. It combined agricultural production, ecological balance and environmental protection, integrated economic results and ecological benefits, and is a model of following ecological laws.

(3) The goal of agricultural environmental protection is to improve the agricultural economic efficiency (including ecological and agricultural production economic benefits). Considerations should be made to ensure the normal function of the ecosystem and the food chain and at the same time take account of the balance of production. In Yexian County, Shandong Province, a county famous for its grain production, 3.8 billion jin of grain were produced in 1979 with an average of almost 1000 jin per mu. This could be labeled high yield production, but in terms of energy input, grain output used 342,000 tons of diesel oil and 100,000 tons of chemical fertilizer. Not taking into account manual and animal labor and agricultural machinery depreciation and energy consumption, fuel and chemical fertilizer alone made the energy output-input ratio a mere 1.82. The U.S. corn production in 1970 had an energy output-input ratio of 2.83. The figure of U.S. corn production took into account all the auxiliary energy consumption for 200,000 jin per labor whereas the Yexian figure took into account only the fuel and chemical fertilizer energy consumption for 2,700 jin per labor. It is clear that the energy consumption for agricultural production in Yexian was much higher. It should be noted that corn, wheat and yams accounted for more than 90 percent of Yexian's grain production, such a composition was far from satisfying the nutritional needs of man and livestock feeding. Yantai Prefecture was itself a typical area of energy-intensive agriculture, its nitrogen fertilizer consumption was 5 times that of the U.S. but the per-unit-area production of corn and wheat was only comparable to that of the U.S. Taking into account

the fact that there were two planting seasons in China, the chemical fertilizer usage in China was still three times that of the U.S.

All of the above remind us that agricultural development must be established on the basis of the equilibrium theory of ecological systems. The overall economic efficiency of agriculture should be evaluated from the viewpoint of ecological balance and ecological economics. Economic and scientific use of fertilizer and pesticide not only ensures low production costs in agriculture but also maintains equilibrium in the agro-ecological environment, reduces environmental pollution and contamination of agricultural byproducts, ensures product quality and prevents disease and insect pests.

Development of methane gas by making efficient use of biomass helps to solve the energy problem in rural areas. It not only reduces damage to other biological resources and forms a mutually promoting closed cycle between crops and the soil, it also ensures high yield and a stable production of crops, maintains high quality and low cost and helps to maintain a relative equilibrium of the agricultural ecology.

Damage and pollution of the agricultural environment have a direct impact on agricultural production. Pollution of the agricultural environment will eventually bring about food contamination and affect the health of one billion people. In addition, we must also realize that protection of the agricultural environment is an important step in developing China.

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DEVELOPMENT OF AGRO-ECOLOGY URGED

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[Article by Zhang Wenqing [1728 2429 1987]: "Agro-ecology and Environmental Protection"]

[Text] The agro-ecological environment is an important component of the natural environment and the survival of the human race depends on it. It is, therefore, an important duty of the various agricultural and environmental protection departments to protect and improve the agro-ecological environment and to promote agricultural production and a healthy cycle in the agro-ecosystem. In recent years, some Chinese and foreign agronomists and ecologists have raised the issue of agro-ecological development, that is, guiding agricultural production with the principles of ecology and obtaining both economic results and ecological benefits. This issue received attention as soon as it was raised.

The Agro-ecological Issue

Agriculture in China is in a transition period from natural economy to commodity economy and from traditional agriculture to modern agriculture. This trend indicates the arrival of a renaissance in Chinese agriculture. But we must also realize that many problems remain in the area of ecological balance and protection of agricultural natural resources that are not conducive to agricultural growth. After many years of experience, people have acquired a certain understanding of the disproportion and losses caused by disregarding economic laws. But most people still do not really understand the disorder and loss in the ecosystem caused by violating the laws of nature, even with the merciless punishment by nature. The acute problems in China's agro-ecology today are soil erosion, the destruction of natural resources and environmental pollution and they have become serious impediments to the healthy development of agricultural production.

Because of damage to vegetation, soil erosion is growing. In many areas, the rate of control exceeds the rate of erosion and, as a result, not only the vast loess plateau looks the same as before, the Chang Jiang valley, with its superior natural conditions, is also deteriorating. Statistics show that 16 percent of the soil in China, 1.5 million square kilometers, have suffered erosion and 5 billion tons of soil are washed away each year.

This makes China one of the counties with the most serious soil erosion problems. Soil is the basis of agricultural production and gullies and ridges cannot be restored. In addition to soil erosion, damage to natural resources is also very serious. For a long period of time, problems such as destroying forests to reclaim wasteland and excessive logging were not properly resolved, as a result forest cover in China has become sparse. Forests have not only lost their major role of protecting the natural ecological balance, they no longer provide weather regulation, water retention, soil conservation, and wind and sand prevention. Even now the grasslands are deteriorating and farm lands are turning into deserts or become salinized. In the past 50 years, almost 50,000 square kilometers of land have turned into deserts and 700 million mu of grassland have degraded. The degradation of grassland is mainly caused by livestock breeding beyond capacity. Take Nei Monggol for example, there were 70 mu of grassland for one sheep in the early years after liberation and now there are only 18 mu for one sheep. Overpopulation is generally 20 to 30 percent. Combined with unplanned reclamation and logging for a long time, the grassland vegetation has seriously deteriorated and productivity has decreased, in some cases the ecological system has collapsed and the land evolved into desert. The danger is that desertification is gradually spreading toward the southeast and, if unchecked, it will pose a direct threat to the vast agricultural lands in the northeast, eastern and northwest China.

Aquatic resources were severely damaged by reclaiming land from lakes and the sea, by water pollution and by excessive catching. Today China still uses 2000-3000 motorized fishing boats putting new pressure on the ecology of offshore fishing grounds. Once the species balance is disrupted, as we all know, it is very difficult to restore. Among the major types of fish caught for marketing, with the exception of ribbon fish, most species have shown signs of declining and production has dropped sharply. The situation of fresh water fishing is similar.

The agricultural environment is also polluted by the industrial "three wastes," and chemical fertilizer and pesticides used in agricultural production. Soil, crops, water livestock and human health are endangered. The agricultural and dairy products produced in some areas were so contaminated that they had to be sealed off or destroyed.

What we have just described is shocking. Agricultural production is in a viscious cycle, hindering further development. Therefore, in addition to the large-scale projects for environmental improvement, we also need to develop a new mode of agricultural production to put the ecosystem on a benign cycle, so that the land resources may be utilized in an optimal fashion, agricultural productivity may be raised, the environment may be improved and the ecosystem may be developed in a balanced manner. The theory of agro-ecology was formed and developed to meet this need.

Contents of Agro-ecology

Agro-ecology is a new model for agricultural production based on the theory of ecology. According to agro-ecology natural resources are developed and

utilized based on local conditions, and different production technologies are used to develop agriculture, forestry, livestock breeding, subsidiary products and fishery in an integrated manner to satisfy the increasing material needs of people in the cities and villages. The task of argro-ecology is to guide and develop agricultural production from an ecological viewpoint. To protect the ecology, improve the environment, maintain resources, develop production and improve the productivity of the agro-ecological system, we should make full use of solar energy conversion, improve the utilization of bio-energy and recycle agricultural production wastes.

Marx once said: "the economic regeneration process, no matter what its characteristics are, is always interconnected with the natural regeneration process in agriculture." In other words, the agricultural regeneration process is not only a cycle in the ecosystem, but also a cycle in the social economy. The contents of agro-ecology invariably touch upon both areas.

1. Make full use of solar energy. The basic theory of agro-ecology is to make use of the photosynthesis of green plants and to improve the conversion of solar energy, accelerate the recycling of material flow (plants, animals, microbes) and energy flow (conversion of solar energy to biological energy) and improve agricultural productivity. Calculation shows that the amount of solar energy the earth receives is about $5X10^{20}$ kilocalories per year, but only 0.2-0.5 percent of that is used by green plants. On average, crops use 0.5-1.0 percent of the solar energy per unit area. Even high yield crops use only 1.5 to 2 percent. During the growth season in some areas this can be as high as 5 percent. If the solar energy utilization rate can be raised to 2-5 percent uniformly over China, it would greatly increase productivity and create an enormous amount of material wealth. Such a goal can be realized through scientific and technological measures in breeding, planting and management.

2. Improve the utilization rate of biological energy and the recycling of wastes. An important task of agro-ecology is the multiple, integrated and rational use of the biological energy. It is used not only to produce food and feed, but also as fuel and fertilizer to fully utilize its material composition. There should be no wastes in agriculture production. What is normally known as wastes, such as stalks, leaves and grass, are traditionally burned as fertilizer or applied directly to the field. This is a wasteful practice. If the leaves and stalks are used in livestock breeding and the animal manure is then used to produce methane, they become not only a source of feed and energy, but also a source of fertilizer. The production of methane is completely in keeping with the law of material recycling in nature. It provides a host of economic results and ecological benefits.

3. Develop rural energy sources. Firewood has always been in short supply in Chinese villages, and there has been serious waste. The thermal efficiency of burning firewood is generally around 10 percent. Due to the shortage of firewood, a great quantity of crop stalks cannot be returned to the field, the soil uniformly lacks organic content and productivity is lowered. The shortage of firewood also leads to the destruction of forests, grasslands and other vegetation; the problem is still not under control. Although

methane development is an effective measure, it can only solve part of the problem. More approaches must be taken based on local conditions such as raising fuel forests, developing small hydropower stations, promoting efficient fuel, wind energy and geothermal energy in order to solve the energy shortage problem properly. This would be highly significant for the protection of forests and grassland, soil conservation, improving soil productivity and maintaining the ecological balance.

4. Protect agricultural natural resources. First and foremost is the protection of green cover, a crucial part in agro-ecology. Green cover includes mainly forests, grassland and the field crops. It is an important factor in weather regulation, water retention, erosion prevention and ecological environmental improvement. Based on the actual conditions in a given area, there should be a proper proportion of forests, grasslands and farmland in order to derive ecological benefits. Second, soil erosion must be controlled. This is an important strategic measure in agro-ecology. The soil may be protected and the erosion prevented by a number of measures including biological, engineering and farming methods. Third, we must protect land resources. For a long time, the traditional practice in agricultural production has put the emphasis on grain production, planting crops that exhaust the land year after year and neglecting the protection of land resources. This is actually a robbing type of production which decreases soil fertility, deteriorates soil composition and reduces the productivity of the land. In agro-ecology we should take ecological measures to nurture the land with the products so that the soil becomes better and more productive. The traditional Chinese practice of returning stalks to the field and applying manure, green fertilizer, night soil, rotational planting and intercropping of leguminous plants have been effective. Fourth, biological species must be protected. Species in the natural ecosystem are interdependent and form a mutually constrained food chain. Changes in one factor often cause a series of ecological inequilibrium and lead to sharp drops in economically beneficial species and large increases in hazardous species. Agro-ecology takes account of many areas and studies effective measures to protect biological species and natural enemies of the pests, and maintain the ecological balance.

5. Prevent Pollution. When the state builds enterprises, commune and brigade industry and subsidiary enterprises and agriculture-industry-business joint venture in rural areas, the rural environment must not be polluted. State regulations forbidding the arbitrary discharge of the "three wastes" must be strictly adhered to. When sewage is used for irrigation and fish hatching, the water quality must meet the standards in the state-issued "Field irrigation water standard" and "Fishery water quality standard." Comprehensive prevention of chemical and pesticide pollution should be promoted and the application of pesticides must follow the "Standards for the safe use of pesticides" to insure agricultural production and a sound living environment.

6. Carry on and foster the superior Chinese tradition in agricultural production. China is a country known for its intensive cultivation and agricultural economic development. Many fine and superior techniques have been handed down. With China's large population, it is no easy task to have everyone fed. In some parts of China the land has been used for thousands of years, the organic content has been maintained and the land continues to provide a high yield, an

important reason is that the peasants followed the principle of maintaining the land with what it produces. Many of the production experiences handed down from ancient times are consistent with the laws of ecology; they serve as a basis for establishing and developing agro-ecology.

7. Promote the normal development of an urban and rural economy and a social ecological system. China is presently going through a phase of across-the-board reform, many provinces and autonomous regions must adopt an administrative system of merging prefectures and cities and the counties will be under the control of the cities. This large change will tie cities and villages and industry and agriculture more closely together. Agricultural production will also enter a phase where agriculture, livestock breeding and fishery will be developed together with industry and commerce and production, supply and sales will be developed as a whole. The development of agro-ecology will benefit the exchange of goods between the city and the countryside, the development of economic diversification, the sharing of resources, the formation of a better production-supply-sales system, a stable development of the urban and rural ecosystem and the comprehensive utilization of urban wastes.

Models of Agro-ecology

Models of ecological agriculture (ecological farms and ecological villages) can be found both in China and abroad. They maintain a sensible balance in the material flow cycle and energy flow cycle. Although some are not yet perfected, they do satisfy the requirements of an ecological agriculture in some areas.

The Maya farm in the Philippines is characterized by a closed cycle that converts wastes into useful material in the production process. The farm raises rice, vegetables and forests which constitute the "producers" that convert the solar energy, the 2 million pigs and several hundred heads of cattle raised by the farm constitute the "consumers" for the rice straw, vegetables and tree leaves, the high concentration organic waste water expelled by the meat processing plant and feedstock manure are used to produce methane and the microbes in the methane fermentation pool serve as the "decomposer" in the ecosystem. Methane provides the energy for production and daily life on the farm and the waste liquid of the methane pool, after drying and treatment, can be used to raise ducks and algae in the pool. Part of the waste water may be directed into the fish pond and part of it may be used as a liquid fertilizer for irrigation, solid waste in the pool may be used as organic topsoil, and the algae raised in the pool may be used to feed the pigs. Farming, cultivation, industry and subsidiary production are all integrated into a complete and coordinated ecological cycle that incorporates the production of agriculture, forestry, livestock breeding, subsidiary production and fishery. This is naturally a more complete model which not only improved the utilization of resources, protected the natural environment, made use of wastes and promoted the recycling of organic matter in the ecological system, but also solved the pollution problem, brought great economic results to the farm and conformed to the basic principles of ecology. It has attracted the attention of many countries.

Although we have not found a typical model like that of the Maya farm in China, a number of places have established models that satisfy the

agro-ecological requirements in some aspects. Some are of the waste-recycle type. For example, in Shunde county, Guangdong province, wastes produced in agriculture production and livestock breeding and daily life (human excrement, animal manure, silkworm excrement, crop stalks and grass) were used for methane production. Methane provided lighting and fuel, the sewage was used for fish hatching, the sludge was used to raise mushrooms and the remaining wastes provided top quality fertilizer for agricultural production. At the same time, it also improved the environment and sanitation in the village.

Some are of the farm-pond ecosystem type in which the interdependence of the living things helped to develop economic diversification. Good examples can be found in Guangdong and Jiangxi. Some are called mulberry-based fish pond and others are called sugarcane-based fish pond or rice-based fish pond. For the mulberry-based fish pond, mulberry trees are planted around the pond, the mulberry leaves are used to raise silkworm, the silkworm excrement is used to feed the fish and the fish excrement returns to the soil. Here the mulberry trees are the "producers," the silkworms are the "first consumer," fish are the "second consumers" and microbes in the pond are the "decomposer." They form a complete closed cycle. The rice paddy fish ponds in Wanzai county, Jiangxi province, are also high gain ecological systems. In the rice paddy the fish feed on insects and grass, the movement of fish loosens the dirt, fish excrement fertilizes the field and the production of both rice and fish benefit. Some hatchery households plant grass along the pond, they use the grass to feed the fish, fish excrement fertilizes the pond, the mud in the pond fertilizes the grass; productivity is high and labor is reduced.

Some brigades in Daxing county, Beijing municipality, use rice straw in methane generation, the residue is used to raise earthworms which in turn are used to feed chicken, chicken excrement is used to raise pigs, and a small cycle based on excrement is formed. A similar example is the oxidation pond of the Xisanjiao brigade outside Shijiazhuang. They plan to use oxidized sewage for irrigation and raising fish, the sludge will be used to produce methane, and will be used to feed earthworms which in turn are fed to the chickens, ducks or martens and the solid waste will become fertilizer. To use their own words, substantial economic results can be obtained by turning the consuming process that produces sewage into a production process.

Other examples are the drought-flood-salinization treatment project and the agriculture-forestry-livestock breeding-subsidiary-fishery comprehensive development project of the Beijing Agricultural University at Zhangzhuang brigade in Quzhou county, Hebei province; and the agricultural modernization experiments conducted by the Chinese Academy of Sciences in Hailun county, Heilongjiang province. These projects were all designed and set up based on ecological principles and have obtained obvious ecological benefits and economic results. In conclusion, Chinese peasants and the workers in agricultural science and technology have, in their production practice, created a set of agro-ecological models that are practical, suit the Chinese situation, and accord with the principles of ecology. We should make an effort to consolidate and promote this experience.

9698
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PLANS TO PROTECT AGRICULTURAL ENVIRONMENT PROPOSED

Shijiazhuang HEBEI RIBAO in Chinese 12 Nov 83 p 2

[Commentary: "Attention Must Be Paid to Protecting the Agricultural Ecological Environment"]

[Text] The agricultural environment is the foundation on which the peasants rely for their existence, as well as the base for developing agricultural production. The quality of the agricultural environment directly influences development of the economy in our province. Protecting the agricultural environment and maintaining the ecological balance are of profound importance for the vigorous development of Hebei. Currently, the agricultural environment in some areas of our province has been seriously damaged. Some areas simply stress "taking grain as the key link," cut forests to reclaim wasteland and cut grass to plant grain. This has led to destruction of the ecological balance in agriculture and severe soil erosion. Other areas have irrationally made use of large amounts of farm chemicals which has led to a chemical content in some grain, livestock and eggs in excess of national standards. This not only lowers the value of the commodities, but also endangers the physical health of the masses. Especially in recent years, following the invigoration of the rural economy and rapid development of commune and brigade-run enterprises, in the process of construction and production, some enterprises have ignored environmental protection and wantonly discharged the "three wastes," which has seriously polluted the agricultural ecological environment. For these reasons, current protection of the agricultural ecological environment should receive a high degree of attention. The comrades in Yutian County have recognized the importance of this question and have undertaken the prevention of pollution from commune and brigade-run enterprises, concentrated on work for protection of the agricultural ecological environment, and have achieved a certain degree of success. Their experiences can serve as a reference.

If we wish to do good work in agricultural ecological environmental protection in Hebei, we must first of all formulate environmental protection plans. We must determine the short-term and long-term goals of economic development and environmental protection, put forth measures for rational distribution and pollution prevention in production, living, communications and other construction projects, and bring them into comprehensive plans for urban construction to achieve coordinated development of industrial and agricultural production and protection of the agricultural environment. Second,

we must adhere to the principle of giving primacy to advance prevention and prevent the emergence of new sources of pollution. Establishment of factories in county seat towns and villages, including the opening of forests, grasslands, mines, quarries, building water conservancy and other projects, regardless of whether it involves new construction, rebuilding or expansion, should all be managed according to the "Management Methods for Environmental Protection in Capital Construction Projects" issued by the state. All polluting construction projects must compile an environmental impact statement for examination and approval by environmental protection departments. Any project which has not been examined and approved and projects which cannot avoid serious pollution or which damage the ecological balance must not be approved for construction. Third, effective measures should be adopted to resolve prominent pollution problems at present in commune and brigade-run enterprises. Enterprises which are upwind or upstream from water sources or in densely populated residential areas which have major pollution dangers and no means of control should gradually change over to other products or move. Commune and brigade-run enterprises which pollute the environment and which were not approved or were privately started must resolutely stop in accordance with related directives. Other enterprises with serious pollution must reduce the quantity of the "three wastes" that are discharged through technical transformation, reform of techniques, updating equipment and developing comprehensive utilization.

12539
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AGRICULTURAL ENVIRONMENTAL WORK CONFERENCE IN TIANJIN

Tianjin TIANJIN RIBAO in Chinese 28 Oct 83 p 1

[Article by Zhang Shuncheng [1728 7311 2052]: "The Municipal Government Convenes an Agricultural Environmental Protection Conference To Set Objectives and Policy in Tianjin's Work in This Area; Industry Will Not Be Permitted to Pass Its Pollution off on Agriculture"]

[Text] From 25 to 27 October, the municipal government convened an agricultural environmental protection work conference to determine the objectives and policies of the present stage of this work in the municipality. This was the first such conference in Tianjin's history.

In addition to responsible comrades from Tianjin's relevant units, departments of the State Council involved in environmental protection work were also invited to send representatives to attend the conference. Vice Mayor Liu Jinfeng [0491 2516 1496] and Yan Zheng [3601 2398], assistant secretary-general of the municipal government, both addressed the conference.

While affirming that Tianjin had made many achievements in this work, the conference also noted that pollution of and damage to the agricultural environment still have not fundamentally been controlled. The city's industry discharges large amounts of the "three wastes"; and each year harmful gases released into the atmosphere, industrial wastewater and considerable amounts of industrial residue, waste soil, refuse and the like have seriously polluted the agricultural environment. In recent years, however, industry in suburban districts, counties, communes and brigades has expanded rapidly. Much of this expansion consists of heavily polluting enterprises that were dispersed to the countryside from the city. Due to their decentralized management, primitive equipment and lack of control measures, these enterprises have seriously polluted the agricultural environment.

Addressing these problems, the conference emphasized that the agricultural environment forms the material basis on which mankind is dependent for survival. Damage to the agricultural environment is fundamental, far-reaching and profound. Thus protection of that environment has become an urgent task in the four modernizations.

The conference established the following objectives for Tianjin's environmental work: to provide a good foundation for foodstuff production; to supply large quantities of good-quality, non-toxic and harmless foodstuffs, by-products and industrial raw materials for the people's livelihood, industrial production and foreign export; to create a clean and beautiful working and living environment for the broad masses of peasants; and to build a new, civilized and prosperous socialist village. To these ends, the conference set the following policy for agricultural environmental work: "to emphasize prevention, link prevention with cure and advance prevention and cure in tandem with production" so as to prevent calamity from ever occurring and to protect the agricultural environment while developing the agricultural economy. The conference decided further to strengthen agricultural environmental protection agencies and leadership in this work.

The conference stated that industrial departments may not shirk their responsibilities in this work but instead must make that task an important component of general environmental protection work and set plans and time tables for controlling the sources of pollution affecting the agricultural environment. Henceforth, industry will not be permitted to pass its pollution off on agriculture.

The conference requested that, when relevant bureaus in economic, construction and planning commissions consider for approval urban and industrial development plans, they appraise not only the urban, but also the surrounding agricultural environment. Feasible measures, the conference declared, must be adopted in order to abate pollution of the agricultural environment.

12431
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RURAL AREAS BECOME FOCUS OF ENVIRONMENTAL PROTECTION

Provincial Meeting on Environment Convened

Nanjing XINHUA RIBAO in Chinese 26 Sep 83 p 1

[Article by Yu Meixian [0060 5019 6343]: "Environmental Protection Develops From City to Countryside: Provincial Meeting To Exchange Experience on Rural Environmental Protection Opens in Rudong"]

[Text] Protecting the rural environment affects the physical well-being of the people and the welfare of future generations. Government at all levels should put it on their agenda and mobilize and organize the forces of society to join in protecting and transforming the environment to make it clean and beautiful and promote beneficial ecological cycles. This was the main topic of Vice Governor Zhang Xuwu's [1728 4872 2976] address to the meeting to exchange experience on rural environmental protection.

The meeting was held from 16 to 19 September in Rudong County. This was the first provincial meeting on rural environmental protection and marks the development of environmental protection work from the city to the countryside.

Since liberation, under the leadership of the party and the government and the efforts of all the people in the province, agricultural and industrial production in the province have steadily developed and agriculture and ecology are in harmony. However, in the process of rapidly developing agricultural sideline production and commune and brigade-run industries, the lack of essential scientific knowledge about rural environmental protection has resulted in pollution and destruction of the rural ecological environment in many areas which grows more serious every day. The most significant manifestations are: urban industrial pollution is spreading, shifting, and extending to the countryside; the development of commune and brigade-run industry has produced new sources of pollution that cannot be controlled in time; some agricultural sideline production methods are destroying natural resources and the ecology, creating a vicious cycle. The representatives at the meeting cited numerous instances to illustrate that the time to emphasize rural environmental protection has come.

Making a special trip to the meeting, after inspecting the environmental protection situation in Suzhou and Nantong, Vice Governor Zhang said that the party Central Committee and the State Council were extremely interested in environmental protection work, and that the provincial committee and government were

concerned about the direct relationship between environmental protection and the national economy and people's livelihood. After explaining the strategic importance of rural environmental protection, he made it a point to note that at present all levels and departments should jointly recognize this national policy, steadfastly and thoroughly protect agricultural resources, consider immediate and long-term benefits, local interests and the overall interests, protect the agro-ecological environment while developing the rural economy, and under these premises go forward with that development. Comrade Zhang also gave his suggestions on how to go about developing environmental protection work.

Bureau director, Ji Jie [1323 6043], representing the provincial environmental protection bureau is drawing up a plan for environmental protection work. At the meeting, representatives from 17 units passed on and exchanged experiences. Some of these units have had notable success in managing the "three wastes" of commune and brigade-run industry. Some have made heartening achievements in the prevention and control of plant disease and elimination of pests, and some have done initial work in establishing a beneficial cycle for the ecological environment.

Balancing Economic Growth and Resource Protection

Nanjing XINHUA RIBAO in Chinese 26 Sep 83 p 1

[Commentary: "Protect Agricultural Resources: Maintain the Ecological Balance"]

[Text] Protecting agricultural resources and maintaining the ecological balance are basic national policies for carrying out socialist modernization. Comrade Hu Yaobang pointed out at the 12th Party Congress that we must "steadfastly protect all agricultural resources and maintain the ecological balance." More recently the party Central Committee has suggested that rational utilization of natural resources and protection of a favorable ecological balance are the prequisites for developing agricultural production. This strategic policy of the central government is of profound significance for our nation's economic development and the prosperity of the people.

Our province has a rather long history of development and is one of the more agriculturally well developed areas in the country. Under the leadership of a series of correct principles and policies of the party and through the diligent labor of the cadres and masses, agricultural production has steadily developed. Overall, agriculture and ecology are in harmony throughout the province. However, a number of comrades have lacked a scientific understanding of the relationship between agricultural production and the ecological environment for an extended period of time. In some localities, insufficient attention has been paid to adapting to and improving the ecological environment and maintaining the ecological balance when developing and using natural resources. Some have gone so far as to disregard ecological laws, reclamation of land from lakes, overfelling of forests, destroying plant cover, eradicating bird species through hunting, disrupting river systems, overfishing, etc., have destroyed the ecological environment and have hindered the healthy development of the agricultural economy. Some localities have overlooked the use of organic fertilizers, overapplied chemical fertilizers and inappropriately increased their usage of

agricultural chemicals, subjecting water quality, soil, air, and foodstuffs to differing degrees of contamination. Some areas have lacked unified planning and leadership in developing urban and commune industries, and because they do not have the necessary pollution control facilities, etc., pollution of the rural ecological environment is getting worse by the day. Destruction of rural resources and degradation of the ecology have become new problems awaiting answers in social and economic development. They cannot be treated lightly, otherwise, we not only harm the people's physical well-being and block economic development, but bring tragedy to future generations.

Now, people are gradually recognizing the importance and urgency of rural environmental protection and many localities have begun to stress this work. However, there are still a few leading comrades who neither heed nor respect environmental science and lack a feel for agricultural ecology. They believe that work on rural environmental protection is going to affect production. Consequently, they neither allocate manpower nor do they register these projects or put them on their agenda. This attitude of setting immediate production and environmental protection in opposition is incorrect. They should know that agricultural production cannot be separated from necessary conditions for the ecological environment. The mission and goal of rural environmental protection is to prevent pollution, protect and propagate resources, set up a beneficial cycle for agriculture and ecology, and promote the healthy development of agricultural production. Naturally, for those who merely consider immediate interests at the expense of long-term interests, and only consider local interests at the expense of the overall interest, rural environmental protection work is a hamstring. It must be. If "draining the pond to catch the fish" and "killing the bird to get the egg" continue, the result will be exhaustation of resources and environmental degradation, and the consequences will be disastrous.

When we speak of environmental protection and maintaining the ecological balance, we do not mean passively preserving natural conditions but actively transforming the environment and building a favorable one for human social development. Without water control projects, we cannot control flood, drought, and waterlogging; without expansion of plant cover, we cannot control water and soil erosion; without the increased application of organic fertilizers, we cannot improve soil nor raise soil fertility. These various facts explain dialectically that rural environmental protection is no hindrance to correct intervention by man into the natural environment, but rather require that people be steadfast in abiding by ecological laws to organize production and achieve the goals of perpetual usable resources and uninterrupted economic development.

At present, the key to the work of protecting and improving the agricultural ecological environment is understanding. Leading cadres especially must become more aware. We should continue to remove "left" influences from the production sphere, respect science, protect the rural ecological environment while developing the rural economy, and make protection of the agricultural ecological environment a precondition for that development. Leading cadres at all levels should foster an ecological outlook, and when drafting plans or organizing production, should bring together ecological, economic, and social benefits. Environmental protection deparrments at all levels must be unshirking in their duty to take on responsibility for coordinating the organization, publicity, guidance, investigation, and supervision of environmental protection. All concerned departments should work in close cooperation and coordination, and strive together to successfully protect the agro-ecological environment.

12303
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ORGANIC AGRICULTURE IN BEIJING

Beijing RENMIN RIBAO in Chinese 29 Nov 83 p 2

[Article by Chen Xianxin [7115 2009 9515] and Bian Yousheng [0593 2589 3932]: "The Beijing Municipal Environmental Protection Institute and the Liuminying Production Brigade Jointly Conduct Agricultural Experiments, Which Demonstrate Advantages in Many Areas"]

[Text] The Beijing Municipal Environmental Protection Institute has cooperated with the Liuminying Production Brigade, which is located in suburban Daxing County to conduct experiments in organic agriculture, the results of which have demonstrated advantageous economic, ecological and social results and won high marks from the Urban and Rural Construction and Environmental Protection Department.

Liuminying Brigade enjoys an average per-mu grain yield of 1,300 jin. Past experience indicates that under these conditions productivity can be further improved only through increased applications of energy and chemical fertilizers. Such increases, however, run the risk of reducing soil fertility, increasing costs and causing environmental pollution. In November 1982, technicians of the Beijing Environmental Protection Institute engaged in the popularization of science--having summarized investigations of the brigade's use of the biological energy source, methane; referred to experience abroad; and employed ecology as a theoretical basis--instructed the brigade to abandon traditional methods of raising productivity and set a plan to readjust its product mix and to promote interactive and comprehensive development among agriculture, forestry, animal husbandry, sideline industry and fishery. This plan, the primary nexus of which is the development of methane, will stimulate intra-system recycling in order to facilitate comprehensive coordination between the expansion of production, regeneration and utilization of energy, ecological and environmental protection and the improvement of economic results.

According to this plan, Liuminying Brigade will change its single agricultural-product structure. The brigade has already constructed new chicken, rabbit, milk cow, lean-meat pig and mushroom houses; fish ponds; feed processing plants; and thus has already taken the first steps toward generating a benevolent cycle of biological energy utilization and resource reuse. The brigade principally produces rice and wheat. Rice straw, for example, can be used as fodder and a "culture medium" for raising mushrooms. Once the mushrooms are harvested, this "culture medium" becomes an excellent fodder or fertilizer. Cow manure, grass and rice straw can be placed in pits to produce methane gas, which provides fuel

for cooking, lighting and heating. Methane residue, moreover, serves as a good fish feed and organic fertilizer. And fish ponds are excellent processors of organic fertilizer. The 4,000 fish the brigade fed entirely with methane residue and liquid were stocked as fingerlings in April of this year. By September, when they were harvested, their average production was 800 jin per mu, and the largest among them weighed 4 jin, 2 liang. The above example demonstrates that rice straw, which was previously used as fuel, can be recycled many times and fully exploited. When in the end the straw is used as organic fertilizer, it enters a new benevolent cycle.

Every household in Liuminying Brigade has also undertaken "family ecology." Chicken cages are constructed above pig sties so that the birds' droppings fall into the sties to serve as feed for the pigs. Methane pits are constructed next to the sties so that the animals' excrement can be placed in the pits to ferment and produce gas. Some commune members have erected plastic enclosures over the pits during cold weather to maintain the temperature therein. These enclosures then are used to grow vegetables and flowers, in effect becoming family greenhouses.

Liuminying Brigade has only just begun developing organic agriculture, yet the results are already obvious. Methane has provided much excellent organic fertilizer for agriculture. During the first 8 months of this year, the entire brigade saved 10,000 yuan worth of chemical fertilizers, yet grain productivity once again rose enormously, with each mu of wheat producing 100 jin more than last year. Methane residue and liquid are used as fertilizer in large vegetable enclosures, the production value of which was 55,000 yuan during the spring and summer and may total 70,000-80,000 yuan by the end of the year, an amount that would be more than three times that of last year. The value of the brigade's total production this year will increase by approximately 15 percent over that of last year, and per capita income may reach 450 yuan.

Liuminying Brigade's experiments in organic agriculture have promoted the development of both material and spiritual civilization and encouraged members to study culture and science. Since the excrement of all domestic animals is fully collected and utilized, one rarely finds chicken and ox feces on the streets and in the yards of this village, whose environment is clean and sanitary. The brigade, therefore, has become one of the municipality's models of spiritual civilization and advanced hygiene units.

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TRANSFORMING ALKALINE LAND IN HEBEI

Beijing RENMIN RIBAO in Chinese 27 Jul 83 p 3

[Text] The comprehensive harnessing of saline-alkali land in China's Huanghuai Hai plain, which suffers from both drought and excessive water, is one of the state's key scientific research projects. Associate Professor Shi Yuanchun [4258 0955 2504] and more than 40 other teachers from the Beijing Agricultural University have put in 10 years of arduous work here and have obtained remarkable results. At their experimental base in Quzhou County, Hebei Province, they have already transformed 230,000 mu of heavily saline-alkali land, where even grass once did not grow. This land has changed into farmland with high and stable yields, as output per mu has increased from more than 100 jin to 700-800 jin. There has been a thorough transformation of the conditions of poverty, under which eating meant dependence on relief food and spending money meant dependence on loans. The comprehensive harnessing of large amounts of saline-alkali land in the Huanghuai Hai plain has broken new ground.

A decade ago, Shi Yuanchun, Xin Dehui [6580 1795 1920], Huang Ren'an [7806 0088 1344], and five other teachers came to Hebei's Quzhou County and settled in Zhangzhuang, the "old alkali pit where in spring there was a vast expanse of whiteness and in summer a vast expanse of water; where only the sound of the drill barrow was heard but no grain was seen entering the granary." In more than 1 year's time they made many investigations, visits, and on-the-spot surveys of Zhangzhuang's natural conditions and the regular patterns of drought and waterlogging on saline-alkali land. After conscientious analysis and research, they recognized the unevenness and saltiness of the groundwater and proposed a comprehensive harnessing method, centered around shallow groundwater, that involved regulating the movement of salt in the water. Every day the teachers and commune members together went into the fields and dug ditches, raked the soil smooth, sank wells, and set up irrigation and drainage facilities. Then they drained large quantities of salty water from shallow wells out of the experimental areas. By controlling the groundwater level they used fresh water from deep wells to wash the saline-alkali land artifically. The first 2 years of harnessing thus achieved early results. Zhangzhuang's production brigade increased its total grain output 40 percent in the first year, while the 2,000-mu experimental area had bumper harvests of grain and cotton. Now the gains of the experiment have been extended to large tracts of saline-alkali land in the Huanghuai Hai plain.

Beijing Agricultural University has now again addressed the conditions of Quzhou County's development of forestry and livestock sideline occupations and launched comprehensive harnessing research. Besides teachers expert in soil chemistry, teachers expert in agronomy, cultivation, farm machinery, meteorology, livestock, crop protection, fruit trees, agricultural economics, and so on have come one after another to Quzhou County and formed a complete and interdisciplinary contingent for comprehensive and scientific agricultural research and the popularization thereof.

By the end of last year, Beijing Agricultural University had established and equipped a testing station in the middle of Quzhou County's heavily saline-alkali land. One after another, some 67 students did fieldwork and wrote their graduation theses here; 3 graduate students completed their research and earned master's degrees; and 6 graduate students are doing research here now. Teachers have written 72 treatises and research reports here.

The fruits of the research by Beijing Agricultural University's teachers and students have received favorable comments from pertinent specialists from the UN International Fund for Agricultural Development and the World Bank. In 1980, these two international organizations signed an agricultural loan agreement with China.

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CSO: 4008/187

GRASS GROWN ON ALKALINE LAND IN JILIN

Beijing RENMIN RIBAO in Chinese 27 Jul 83 p 3

[Text] According to a report in JILIN RIBAO, Wu Qingnian [0702 7230 1608] and other scientific research personnel at the Jilin Agroscience Academy's Livestock Institute have done scientific experiments in planting alkali-converting plants in the saline-alkali land of what is called western Jilin's "naturally forbidden zone" for farm crops. A decade of research and experimental planting has concluded successfully. Green, lush, and high-quality forage grass is growing on more than 1,000 mu of saline-alkali land.

Based on the reports of the departments concerned, one-fourth of western Jilin's grassland has degenerated into saline-alkali land. What people call "soil sores" and "alkali scar gashes" seriously impede the development of animal husbandry and agriculture on the grassland. In order to solve this difficult problem, research fellow Wu Qingnian of the Jilin Agroscience Academy's Livestock Institute used biological improvement methods in on-the-spot surveys. He performed several thousand vessel tests in his laboratory and 130 small tests in the field on a trial basis. With the support of the State Council's relevant ministries and scientific research departments, he did planting experiments on large tracts of land in 1978. On more than 1,000 mu of heavily alkaline land he grew this kind of high-quality forage grass, thus surmounting the difficult situation of either no grass or no grass of good quality growing on alkaline grassland.

The alkali-converting plants that Wu Qingnian planted by using scientific planting techniques have high utility value. According to an on-the-spot survey, green grass production is 726 jin per mu. After some contrasting experiments in raising and feeding sheep with this kind of alkali-resistant plant's hay and with normal hay, the results were as follows: during a 90-day raising period, a flock of 45 sheep eating the former hay had an average weight of 2.7 jin per head while a comparable flock eating the latter hay had an average weight of 1.8 jin per head.

The success of this kind of alkali-converting plant in improving alkaline grassland's vegetation is not only beneficial to the development of animal husbandry on grassland, but, more importantly, it is also beneficial to grassland ecological balance and can prevent alkaline land from devouring farmland and eroding grassland. Adherence to the use of this kind of high-quality plant for transforming large tracts of alkaline land can accelerate the pace of grassland construction.

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AMELIORATING SALINE SOIL IN HENAN

Beijing RENMIN RIBAO in Chinese 19 Apr 83 p 2

[Article by Li Jie [2621 2638]: "A White Expanse of Alkali in the Past Is Now a White Expanse of Cotton, Shangqiu Has Been Evaluated as an Advanced County in Improving the Soil and Treating Alkali in Henan Province"]

[Text] "Shangqui County, Henan Province used improvement of the soil and controlling alkali as breakthroughs to reform low-yield fields, the results are notable. Recently, the county was judged by Henan province as an advanced county in improving soil and controlling alkali.

Shangqui County is situated in the heart of the eastern plains of Henan and on the south side of the ancient river channel of the Huang He. Of the 1.5 million mu of cultivated land throughout the county, 540,000 mu are low-yield fields of sandy and waste land, saline and alkaline land, and lowlands that are easily flooded. Of this area, more than 200,000 mu are heavily affected by alkali. These fields have kept the people of the whole county in a long period of poverty. In 1980, after implementing the contract responsibility system on a widespread basis, a number of farmers urgently asked that this backward situation be quickly changed. The county committee and the county government joined the Chinese Agricultural Sciences Academy, the Henan Agricultural Academy and such units to establish experimental areas in the two communes of Lizhuang and Xieji. They began improving land heavily affected by alkali. They used wells for irrigation and drainage, diverted water from the Huang He to make up for the shortage of water sources, dug ditches to drain water, lowered the underground water table, planted green manure, expanded the planting of crops tolerant to alkali and such comprehensive experiments and were successful. Xieji Commune situated at the foot of the ancient dyke of the Huang He has an area of 15,000 mu of saline and alkaline land. It was a well-known poverty striken area suffering from many disasters and it produced a low yield. And using scientific methods to improve the soil and control alkali, an unprecedented bumper harvest was realized last year when serious natural disasters occurred. Compared to 1979, the total output of cotton increased 5 times, the total output of food grains increased onefold, per capita income was more than 290 yuan, an increase of threefold. Bank savings of commune members increased four times. The masses said happily: "There was a white expanse in the past and there is a white expanse now. The white expanse of the past was alkali, the white expanse now is cotton. Planting cotton in alkaline land yields cotton and money."

With the encouragement of the experimental areas, the enthusiasm of this county's farmers to improve the soil and control alkali rose. They found some effective methods: using level furrows to avoid alkali, applying fertilizers at the bottom of furrows, using nutritious soil in pots to cultivate seedlings, changing the soil and applying organic fertilizers around the plant, conscientious intertilling to prevent the formation of hardened soil. At the same time, they joined together to level the land, and repaired the drainage and irrigation system. Since 1979, two major river channels and 1,189 drainage canals of a total length of 1,475 kilometers were dug, more than 11,000 wells were sunk, more than 1 million mu of land were leveled throughout the county, animal husbandry was developed vigorously, and superior quality fertilizers were used to improve low-yield fields.

9296
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LIST OF NATURE PRESERVES IN CHINA

Beijing DAZIRAN [NATURE] in Chinese No 4, 8 Dec 83 pp 54-55

[Article by Shi Guangfu [2457 0342 1318]]

[Text] Nature preserves are an important base devised by man to protect various sorts of natural resources. Nature preserves are established to save and protect certain biological species that face extinction, monitor the impact of human activities on nature, study and maintain the environmental prerequisites for human existence and the laws of evolutionary change of living creatures themselves, and seek out scientific approaches for the rational utilization of resources.

There has been quite rapid development in establishing Chinese nature preserves in the past few years. By the end of 1982, 21 provinces (and autonomous regions) had set up 106 natural protection districts, with a total area of approximately 3.9 million hectares accounting for about 0.4 percent of the national territory. This has a definite role in preserving certain representative forests, rare and valuable plants and wild animal resources. With the development of the four modernizations, all localities must continue to set up some nature preserves, and gradually form a network of nature preserves which is rationally distributed and of varied types, and thus leave this precious natural wealth to our descendents.

PROVINCE/ AUTONOMOUS REGION	NAME OF NATURE PRESERVE	LOCATION	AREA (HECTARES)	PRIMARY OBJECTIVE	YEAR ESTAB-LISHED	MANAGING DEPARTMENT
SHANXI	Luyashan Nature Preserve	Ningwu, Wuzhai, and Kelan Counties	21,453	the rare temperate zone sub high mountain coniferous forests	1980	Provincial Forestry Department
	Pangchuangou Nature Preserve	Wenshui and Fangshan Counties	10,466	Same as above	1980	Same as above
NEI MONGGOL	Baiyinaobao Nature Preserve	Keshiketeng Banner	6,000	arid desert area's dragon spruce (baigan)	1979	Autonomous Region's Forestry Department
	Daqinggou Nature Preserve	Ke'erqin Left Rear Banner	8,466	rare desert area broad leaf forest	1980	Same as above
	Suosuolin Nature Preserve	Chaoge Banner	53,333	desert plant cover sacsaoul	1980	Same as above
LIAONING	Laotieshan Shedao Nature Preserve	Dalian City	1,100	migratory birds, snakes	1908	Provincial Environmental Protection Bureau
	Laotudingzi Nature Preserve	Huanren County	5,933	Changbaishan plant district system	1981	Provincial Forestry Department
	Xianrendong Nature Preserve	Zhuanghe County	1,733	forests and natural environment	1981	Same as above
	Yiwulushan Nature Preserve	Beizhen and Yixian Counties	8,800	mixed Chinese pine and broad-leaf forest	1981	Same as above

LIAONING (continued)	Baishilazi Nature Preserve	Kuandian County	6,667	mixed red pine and broadleaf forest	1981	Provincial Forestry Department
	Fenghuangshan Nature Preserve	Dandong City	2,600	rare plants and animals	1981	Same as above
JILIN	Changbaishan Nature Preserve	Antu, Fusong and Changbai Counties	190,000	forest ecological system, natural historical re-mains, rare plants and animals	1961	Provincial Forestry Department
	Xianghai Nature Preserve	Tongyu County	106,667	rare water birds, cranes and storks	1981	Same as above
	Momoge Nature Preserve	Zhenlai County	30,000	same as above	1981	Same as above
	Zuojia Nature Preserve	Yongji County	6,000	natural secondary forest	1982	Chinese Academy of Science
HEILONG-JIANG	Fenglin Nature Preserve	Yichun County	18,400	red pine natural forest, mother forest	1963	Provincial Academy of Forestry Science
	Zhalong Nature Preserve	Qiqihar City	42,000	red-headed crane and other rare water birds	1979	Provincial Forestry Department, City Forestry Bureau
	Jingbohu Nature Preserve	Ningan County	120,000	volcanic opening forest, natural scenery	1980	Provincial Government General Office

HEILONG-JIANG (continued)	Wudalianchi Nature Preserve	Dedu County	70,000	natural environment and volcanic lava	1980	Provincial Government General Office
	Qixinglazi Nature Preserve	Hua'nan and Jixian Counties	33,000	northeast (Siberian) tiger and natural environment	1980	Hejiang Administrative Office, Forest Management Bureau
	Mudanfeng Nature Preserve	Mudanjiang City	40,000	natural secondary forest ecological system	1981	City Forestry Bureau
	Liangshui Nature Preserve	Yichun City	6,394	primitive red pine forest	1980	Northeast Forestry College
	Heilonggong Nature Preserve	Shangzhi County	3,600	tree frog amphibian	1982	County Forestry Bureau
ZHEJIANG	Tianmushan Nature Preserve	Lin'an County	667	mid-sub-tropical and northern green forest plant cover	1975	Provincial Forestry Department
	Gutianshan Nature Preserve	Kaihua County	200	mid-sub-tropical forest cover	1975	Same as above
	Niaoyanling Nature Preserve	Taishun County	366	mid-sub-tropical forests and rare bird--yellow-bellied tragopan	1975	Same as above
	Fengyangshan Nature Preserve	Longquan County	4,665	mid-sub-tropical forest and rare baidoushan	1975	Same as above

ANHUI	Yangzi'e Nature Preserve	Xuancheng, Guangde and Nanling Counties	----	the Yangzi crocodile--China's unique reptile	1977	Provincial Forestry Department
	Qingliangfeng Nature Preserve	Xixian County	2,667	rare trees and wild animals	1979	Same as above
	Machongling Nature Preserve	Jinzhai County	3,500	northern sub-tropical deciduous forest	1982	Same as above
	Huangcangyu Nature Preserve	Xiaoxian County	2,334	temperate zone deciduous broad-leaf forest	1982	Same as above
	Guniuxiang Nature Preserve	Qimen and Shitai Counties	6,467	mid-sub-tropical evergreen and broadleaf forests and rare animals	1982	Same as above
	Huangpushan Nature Preserve	Chuxian County	3,600	northern sub-tropical deciduous broadleaf forests and various kinds of ducks	1982	Same as above
FUJIAN	Wanmulin Nature Preserve	Jian'ou County	110	mid-sub-tropical evergreen and broadleaf forests	1957	Prefectural Forestry Bureau
	Huakou Nature Preserve	Sanming City	800	rare forests	1964	Same as above
	Wuyishan Nature Preserve	Jianyang, Chong'an, and Guangze Counties	57,257	sub-tropical forest ecological system, rare plants and animals	1979	Provincial Forestry Department

FUJIAN (continued)	Nanjing Letu Nature Preserve	Nanjing County	20	southern sub-tropical rain forests	1963	Provincial Science Commission
JIANGXI	Jiulianshan Nature Preserve	Longnan County	4,066	mid-sub-tropical evergreen, broad-leaf forests	1981	Provincial Forestry Department
	Qianshan Nature Preserve	Qianshan County	5,300	mid-sub-tropical evergreen, broad-leaf forests	1981	Same as above
	Guanshan Nature Preserve	Yifeng County	6,500	mid-sub-tropical evergreen, broad-leaf forests	1981	Same as above
	Jinglanshan Nature Preserve	Ninglan and Yongxin Counties	15,873	forest ecological system and natural environment	1981	Same as above
	Lushan Nature Preserve	Jiujiang and Xingzi Counties	30,466	forest ecological system and natural historical remains	1981	Same as above
	Taohongling Nature Preserve	Pengze County	4,000	wild sika deer	1981	Same as above
	Dani Nature Preserve	Jing'an County	----	the amphibian--giant salamander	1981	County Marine Products Bureau
HENAN	Baotianman Nature Preserve	Neixiang County	6,333	temperate zone natural secondary forest	1980	Provincial Forestry Department
HUBEI	Shennongjia Nature Preserve	Fangxian, Xingshan and Badong Counties	80,000	forest ecological system and rare plants and animals	1978	Provincial Forestry Department

HUBEI (continued)	Xingdoushan Nature Preserve	Lichuan, Xianfeng and Enshi Counties	2,880	extremely old varieties of rare trees	1981	Prefectural Forestry Bureau
	Xiaohe Nature Preserve	Lichuan County	----	YUANSHENG SHUISHAN MUSHU [proto meta-sequoia parent trees]	1981	County Forestry Bureau
GUANGDONG	Jianfengling Nature Preserve	Ledong County	1,600	tropical rain forest and the rare, gibbon, peacock and other animals	1960	Provincial Forestry Department
	Datian Nature Preserve	Dongfang County	2,533	the rare Hainan slope deer	1976	Same as above
	Bangxi Nature Preserve	Baisha County	333	Same as above	1976	Same as above
	Nanwan Nature Preserve	Lingshui County	933	rhesus monkey	1976	Same as above
	Xingang Nature Preserve	Heyuan County	933	the rare water deer	1976	Same as above
	Dingheshan Nature Preserve	Zhaoqing City	1,133	southern sub-tropical seasonal rain forests	1956	Huanan Botan-ical Station
	Bawangling Nature Preserve	Changjiang County	2,000	tropical forests and gibbons	1980	Provincial Forestry Department
	Dongzhaigang Nature Preserve	Qiongshan County	2,600	mangrove forests	1980	Same as above

GUANGDONG (continued)	Qingpilin Nature Preserve	Wanning County	1,067	blue bark of the rare fragrant longnao tree	1980	Provincial Forestry Department
	Heishiding Nature Preserve	Fengkai County	1,333	southern sub-tropical rain forests	1979	Prefectural Forestry Bureau
	Chebaling Nature Preserve	Shixing County	7,545	rare plants and animals	1982	County Forestry Bureau
	Baijianniao Nature Preserve	Xishadongniao	----	white tuna bird and other water birds	1980	Zhuniao/Local armed forces unit
	Liulianling Nature Preserve	Wanning County	2,200	tropical secondary forest	1981	Hainan Administrative Office, Forestry Bureau
	Qinglangang Nature Preserve	Wenchang County	2,000	mangrove forests	1981	Same as above

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CONCLUSION OF LIST OF CHINA'S NATURAL PRESERVES

Beijing DAZIRAN [NATURE] in Chinese No 1, 8 Mar 84 pp 57-8

[Prepared by Shi Guangfu [2547 0342 1318]]

[Text] A List of Natural Preserves in China: Final Part

Province, autonomous region	Natural preserves	Location [county]	Area (hectares)	Targets of protection	Year estab-lished	Responsible agencies
Guangxi	Huaping	Longsheng, Lingui	6,667	Rare Cathaya argyrophylla, Central Asian tropical rain forest	1961	Prefectural Forestry Bureau [FB]
Guangxi	Miaoer Shan	Xing'an, Ziyuan	10,667	Rare tree species, headwater forest	1976	Prefectural FB
Guangxi	Longgang	Longzhou, Ningming	9,467	Limestone rock formations, forest ecosystem, rare flora & fauna	1979	Guangxi FB
Guangxi	Chongzuo	Chongzuo	5,133	Rare white-headed langurs	1981	County FB
Guangxi	Fusui	Fusui	10,000	Same as above	1981	County FB
Guangxi	Daxin	Daxin	9,333	Rare white-headed langurs, black leaf monkeys	1980	County FB
Sichuan	Wanglang	Pingwu	27,700	Giant pandas, other rare fauna	1963	Sichuan Forestry Department [FD]
Sichuan	Wolong	Wenchuan	200,000	Giant pandas, other rare fauna, forest ecosystems	1975	Ministry of Forestry, Sichuan FD
Sichuan	Tangjia He	Qingchuan	40,000	Same as above	1978	Sichaun FD
Sichuan	Mabian Dafengding	Mabian	30,000	Same as above	1978	Sichuan FD
Sichuan	Meigu Dafengding	Meigu	16,000	Same as above	1978	Sichuan FD

[continued]

[continuation]

Province autonomous region	Natural preserves	Location [county]	Area (hectares)	Targets of protection	Year estab- lished	Responsible agencies
Sichuan	Jiuzhau Gou	Nanping	60,000	Same as above	1978	Sichuan FD
Sichuan	Fengtong Zhai	Baoxing	40,000	Same as above	1975	Sichuan FD
Sichuan	Xiaozhaizi Gou	Beichuan	6,700	Same as above	1979	Sichuan FD
Sichuan	Baihe	Nanping	20,000	Golden monkeys, other rare fauna	1963	Sichuan FD
Sichuan	Tiebu	Zoige	23,000	Wild sika, other rare fauna	1965	Sichuan FD
Sichuan	Laba He	Tianquan	12,000	Takin, other rare fauna	1963	Sichuan FD
Sichuan	Jinfo Shan	Nanchuan	900	Cathaya argyrophylla, other rare trees	1979	Sichuan FD
Sichuan	Jinyun Shan	Chongqing suburbs	1,400	Asian tropical forest, natural landscape	1979	City FB
Guizhou	Fanjing Shan	Jiangkou, Yinjiang, Songtao	38,000	Central Asian tropical forest ecosystem, rare gray snub-nosed monkeys, dove trees	1978	Prefectural FB
Guizhou	Leigong Shan	Leishan, Taijiang, Jianhe, Rongjiang	47,300	Central Asian tropical forest ecosystem, rare bald cypress	1982	Prefectural FB
Yunnan	Xishuangbanna	Jinghong, Menghai, Mengla	200,000	Tropical rain and monsoon forests, rare flora and fauna	1958, redrawn 1981	Provincial FD, Autonomous Prefecture FD
Yunnan	Nangun He	Cangyuan	6,671	Tropical monsoon forest, rare wild elephants, South Asian tigers	1980	Same as above

[continued]

[continuation]

Province autonomous region	Natural preserves	Location [county]	Area (hectares)	Targets of protection	Year estab-lished	Responsible agencies
Shaanxi	Taibai Shan	Zhouzhi, Taibai, Mei	54,158	Forest ecosystem in temperate-tropic transition zone	1965	Shaanxi FD
Shaanxi	Foping	Foping	35,000	Giant pandas, forest ecosystem	1978	Ministry of Forestry, Shaanxi FD
Gansu	Baishui Jiang	Wen, Wudu	95,292	Same as above	1978	Ministry of Forestry, Gansu FD
Gansu	Dongda Shan	Zhangye	4,921	Qinghai dragon spruce and its habitat	1980	Gansu FD, County FB
Gansu	Shoulu Shan	Jingtai	11,060	Same as above	1980	Gansu FD, County FB
Gansu	Changling Shan	Gulang	3,679	Same as above	1980	Gansu FD, County FB
Gansu	Lianhua Shan	Lintan, Kangle	6,866	Forest ecosystem, scenic forest	1982	Gansu FD, County FB
Qinghai	Niaodao	Gangca, Qinghai Hu	53,550	Bar-headed geese, sea gulls, egrets, other waterfowl	1975	Qinghai Agricultural & Livestock Department, FB
Qinghai	Mengda	Xunhua	9,544	Plateau forest, rare tree species	1980	Same as above

[continued]

[continuation]

Province autonomous region	Natural preserves	Location [county]	Area (hectares)	Targets of protection	Year estab-lished	Responsible agencies
Ningxia	Helan Shan	Shizuishan Pingluo, Helan, Shizuishan City, one other county	61,000	Arid, sand-blown forest ecosystem and geological glaciers	1982	Ningxia FD
Ningxia	Liupan Shan	Guyuan, Longde, Jingyuan, 2 others	7,000	Headwater forest, geographical cross sections	1982	Ningxia FD
Ningxia	Luoshan	Tongxin	8,900	Arid-region forest ecosystem	1982	Ningxia FD
Ningxia	Yunwu Shan	Guyuan	1,300	Arid prarie ecosystem	1982	Ningxia Animal Husbandry Department
Xinjiang	Baer Buluke	Yumin	1,500	Sweet almonds and their habitat	1980	Prefectural FB
Xinjiang	Huyanglin	Yuli	20,000	Desert diversiform-leaved poplar forests	1980	Xinjiang FD
Xinjiang	Ha'nasi	Burqin	90,000	Forest ecosystem, natural landscape	1980	Xinjiang FD
Xinjiang	Buergen He	Qinghe	5,000	Beavers and their habitat	1980	Xinjiang FD
Xinjiang	Tianchi	Fukang	6,000	Forest ecosystem, natural landscape	1980	Xinjiang FD

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[continuation]

Province autonomous region	Natural preserves	Location [county]	Area (hectares)	Targets of protection	Year established	Responsible agencies
Xinjiang	Buyin Buluke	Hejing	100,000	Rare swans and their habitats	1980	Xinjiang FD
Xinjiang	Tuomuer Feng	Wensu	100,000	Forests, wild animals, glaciers	1980	Xinjiang FD
Xinjiang	Kalamaili Shan	Qitai, Fuyun, Qinghe, Jimsar	1,400,000	Wild asses, argali, [e hou] antelopes, other wild ungulates	1982	Xinjiang FD

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CSO: 4008/218

CLASSIFICATION OF NATURAL CONSERVATION REGIONS IN CHINA

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese No 5, 1983 pp 71-73

[Article by Wang Yuqing [3769 3768 1987], Environmental Protection Bureau of the Ministry of Urban and Rural Construction and Environmental Protection, "Some Views on Classification of China's Natural Conservation Regions"]

[Text] There have been major developments in the cause of natural conservation regions in China in recent years. Currently, more than 400 natural conservation regions have been established or are in the planning stage. In the concept of natural conservation regions in China, however, there are uncertainties as to the scope they include and their types. This makes selection, establishment and management of natural conservation regions quite difficult. For this reason, it is necessary to scientifically classify the categories of China's natural conservation regions according to national conditions, and in reference to foreign experiences. This article will discuss some individual viewpoints.

Classification of natural conservation regions is a fairly complex question. According to the categories of the "1980 United Nations Table of National Parks and Conservation Reigons" of the International Alliance for Protection of Nature and Natural Resources, there are ten types of conservation region categories.

1. Scientific conservation regions. These are also called strict natural conservation regions, and have important scientific value. They have virgin or model natural ecosystems, and can serve as representatives of each type of ecosystem for each biogeographical region in different natural zones, and are a storehouse of natural resources and source of biological species. Mankind can use them to do research on the fundamental laws of natural ecology and monitor environmental changes.

2. National (or local) parks. These are generally regions managed by national or local government administrative organizations which are large in area, and have one or more fairly intact ecosystems and beautiful scenery. They can be used for scientific research, education and tourism.

3. Natural relics. These are natural conservation regions set up for protection of precious natural heritages. These natural vestiges include key state-protected precious animal and plant species, geological sections, volcanoes, waterfalls, limestone karst landscapes, caves, glaciers, glacial vestiges, hot springs, and other geological structures and landforms with scientific, economic, educational, aesthetic or other value.

4. Conservation regions for natural protection. These are also called managed natural preserves or wild biological protection regions. The goal is to protect special ecosystems, biological communities and species. They include the habitats of these species, such as special habitats required by species in swamps, lakes, river mouths, forests, grasslands, etc., to permit species of major importance (including migratory animal herds) to reproduce and survive.

5. Landscape conservation regions. These refer to regions of beautiful scenery with conservation value with successful forms of land utilization. The landscapes of these regions can represent certain cultures, reflecting the historical traditions and customs, religious beliefs, production activities, etc., of local people.

6. Natural resources conservation regions. These usually refer to uninhabited or sparsely inhabited inaccessible regions covering large areas. Exploitation is usually difficult, and inappropriate exploitation could bring on serious results. For this reason, they are protected as natural resource preserves for a specific period of time.

7. Anthropological conservation regions. These are also called natural biological regions. They mainly refer to natural regions which include the people within them. The people are still in a primitive state, and rely on natural animals and plants for their livelihood, and do not engage in any form of agricultural or animal husbandry production. They are very important for research on human evolution.

8. Multi-use management regions. They are also called natural resource management regions. They refer to regions which carry out scientific management to permit perpetual utilization of important renewable natural resources within the region. They can serve as models for rational natural resource utilization in forestry centers, pasturelands, fisheries, pig farms, river sources, etc.

9. Biosphere conservation regions. These refer to conservation regions in the international biosphere conservation regions coordination network.

10. World cultural and natural heritage regions. These refer to conservation regions which have been listed in the "World Heritage Table" according to the "World Cultural and Natural Heritage Conservation Treaty." This category can be divided into three types: 1. Conservation mainly of cultural heritages; 2. Conservation mainly of natural heritages; 3. The first two in combination.

The first eight of the above ten categories of conservation regions are mutually independent. The last two also include several specially-designated conservation regions of the first eight types. These categories of conservation regions include both relatively primitive natural environments and regions which have already been opened up by man; they include both conservation of natural heritages and cultural heritages, and are fairly broad in scope.

Just how should we understand and demarcate the overall outline and scope of inclusion of China's conservation regions should be done in reference to the above methods provided by international organizations, and should also integrate our country's actual conditions and current administrative systems. China is a country with a long history and ancient civilization, and, regardless of whether we are speaking of the types or number of places, there are few countries in the world with so many historical relics and ancient vestiges having conservation value. For just those sites which have been promulgated by the state, there are already 242 key cultural relic preservation units which have been promulgated by local governments. The state has established a National Cultural Relics Management Bureau directly under the State Council to undertake responsibility for this line of work. For this reason, the role and goals of China's natural conservation regions should be to protect the natural environment and various model types of natural ecosystems, and to protect valuable natural and historical vestiges. The concept should be understood as follows: it is a region that is specifically designated and administered by the People's Government mainly for the purposes of protecting the natural environment and natural resources, for protecting representative natural ecosystems, and for protecting various natural and historical vestiges with conservation value, in order to promote the development of science, education, culture, and other causes, and to promote economic construction. On these grounds, China's natural conservation regions should not be regions which mainly protect cultural relics, nor should they be several tourist resorts with important legacies of Chinese civilization.

CLASSIFICATION TABLE OF NATURAL CONSERVATION REGIONS IN CHINA

Type I: Primary environmental natural conservation regions

Natural conservation regions established to protect various types of comprehensive environments and their ecosystems, which are in different natural zones, and which are representative or primitive, within each large area.

Further categories: Forests, grasslands and wilderness areas, alpine vegetation, swamps, grassy marshlands, rivers and lakes, islands, tide pools, seas, and other ecosystems.

Type II: Secondary environmental natural conservation regions

A type of natural conservation region established to protect representative, natural ecosystems in different natural zones within a large area for the purposes listed below. Among them, any primary vegetation or ecosystems which have already been improperly damaged, but which have only been slightly interfered with by human activity, can be restored with slightly more protection to similar primary vegetation or the original animals.

Further categories: Forests, grasslands and wilderness areas, alpine vegetation, swamps, grassy marshlands, bodies of water, islands, tide pools, and other ecosystems.

Type III: Biological resources natural conservation regions

Natural conservation regions established for protection of certain special biological resources, especially precious endangered animal or plant species.

Further categories: Precious animal and plant species, areas where hunting is prohibited, ancient or famous trees, valuable wild species of cultivated plants.

Type IV: Geological relics natural conservation regions

Natural conservation regions established to protect natural geological or geomorphological vestiges with special value.

Further categories: Geological sections, fossil sources, limestone caves and landscapes, hot springs, glacial traces, and other geomorphological features.

Type V: Resource management natural conservation regions

Natural conservation regions established to protect the regions listed below. By means of rational management, the resources within the region can be renewed to allow perpetual utilization, and which can serve as model regions for rational utilization as forestry centers, pasturelands, fisheries, pig farms, etc.

Further categories: Forests, grasslands, bodies of water and aquaculture regions, hunting areas, and others.

Type VI: National park natural conservation regions

Natural conservation regions established to protect the regions listed below. They have fairly complete natural syntheses or natural ecosystems. They

also often have precious natural and historical relics, cover a large area, have beautiful scenery, and are suitable for tourist districts.

Taking this concept as the starting point, and categorizing them according to the role and object of conservation. I propose six categories for natural conservation regions in China as shown in the classification table.

Type I regions include the existing conservation regions of Changbai Shan, Wuyi Shan, Fanjing Shan, Hanasi Hu (Burjin County, Xinjiang), etc., as well as natural protection regions planned for construction such as Shennongjia Shan and Aerjin Shan (Ruoqiang County, Xinjiang), etc. This type of conservation region is mostly found in sparsely populated remote mountainous, highland or wilderness frontier areas such as the northeast, southwest and northwest, etc. Type II conservation regions include already established natural conservation regions such as Dinghu Shan (Zhaoqing County, Guangdong) and Henan's Baotianman Muhu [1405 1131 2581 3668 5706] peak (Neixiang County), etc., as well as natural conservation regions planned for construction such as Xiaolong Shan in Gansu (Tianshui County), Ziwu [1311 0582] ridge in Shaanxi (Huangling County), and Xiaowutai Shan in Hebei (Weixian and Hanlu counties [as published--Hanlu [3211 7773] evidently a typographical error, probably means Zhuolu county]). More of this type of conservation region should be established in areas which were opened for exploitation relatively early, such as mountainous areas and loess plateaus in northern China and mountainous areas in southern China. Type III conservation regions include the already established natural conservation regions for the Datian mountain deer on Hainan (Dongfang County), Heilongjiang's Fenglin Korean pine grove (in Yichuan City), etc., as well as the regions planned for establishment for Qinghai's Longbao lake Black-necked crane (in Yushu County), the wild walnut forest in Xinjiang (Gongliu County), and so on. Type IV regions include the already established five large lotus pools in Heilongjiang (Dedu County), as well as the planned natural conservation regions for Lanzhou's Dingxi loess section in Wuquan Shan, Baita Shan and Jiuzhoutai (in Lanzhou City), Gansu's Mayaxue mountain's ancient glacial traces (in Tianzhu County), the limestone petrified forest and caves in Xingwen County, Sichuan and so on. Type V conservation regions are especially important in China at present, especially for many pasturelands and fisheries. Some conservation regions are sealed off and prohibit any form of utilization. Actually, this is impermissible, as well as unnecessary. There should be rational utilization of pasture and fisheries resources by means of scientific management. Planned establishment of this type of conservation region includes the natural conservation regions in the Yili Xinjiang Tianshan grasslands, the Zhoushan archipelago Zhejiang maritime fisheries area, Honghu in Hubei, and so on. Type VI conservation regions include the already established natural conservation regions such as the Tianshan Xinjiang natural lake, the Huanglong Kiuhan ravine in Sichuan (Songpan County), etc., and the planned establishment of the Xiling gorge in Hubei, the state forest park in Zhangjiajie, Hunan, and so on.

Apart from these, there is a lot of controversy at present over whether or not water conservation forests or water and soil conservation forest protection regions should serve as natural conservation regions. The author feels

that it is fairly inappropriate for these two types to serve as natural conservation regions, and that they should not be given a special classification.

It should be explained that this type of classification can overlap in some aspects. When this situation is encountered, there should be comprehensive analysis and comparison of all factors to determine the necessary classification categories according to the goals of classification and in accordance with a focus on the main factors. In terms of tourism, for example, it would appear that in some senses, all natural conservation regions seem to have tourism value. Type VI in the classification, national park natural conservation regions, refers to large regions with beautiful scenery, convenient communications, with certain tourist facilities, as well as usually having a historical tradition of tourism. For example, Sichuan's Wolong natural conservation regions has a very important single role--to protect the panda. However, it is most appropriate to classify it not as Type II, a biological resources natural protection region, but instead as a Type I primary environment natural conservation region.

12539
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ESTABLISHMENT OF NATURE PRESERVES DISCUSSED

Beijing HUANJING KEXUE [JOURNAL OF ENVIRONMENTAL SCIENCES] in Chinese No 2, 30 Apr 83 pp 70-73

[Article by Li Xiaofang [2621 1420 5302], Hunan Province Environmental Protection Office, and Yang Yiguang [2799 0001 0342], Department of Geography, Hunan Normal Institute: "Nature Preserves"]

[Text] Establishing nature preserves is an important means of protecting natural resources, especially valuable and endangered biological resources. Since the 1970's, the natural environment and protection of natural resources have become matters of worldwide concern. In 1972, UNESCO first included a new research topic, National Regions and their Indigenous Genetic Material, in its Man and the Biosphere plan. In recent years, nature protection and nature preserves have been undergoing planned development worldwide.

I. The term "nature preserve" may be understood in either a narrow or a broad sense. In the narrow sense it refers to a natural area with representative natural landscapes and rare and valuable animals and plants; in the broad sense it also includes natural scenic areas, water resource areas and particularly important localities (such as cultural sites and tourist attractions), or, in sum, any natural area which requires special protection.

In China, the first "Provisional Nature Preserve Regulations (Draft Version)" appeared in 1973. In addition, the World Nature Preserve Guidelines were published on 5 March 1980. A nature preserve designation group under the National Agricultural Districting Committee was formed in the same year, and in September it convened a conference which requested that all provinces draft nature preserve designation plans during 1981.

The damage caused by man's development and utilization of natural resources has long had serious effects on the natural balance, and in order to maintain harmony in nature it has become necessary to step up protection of the natural environment; nature preserves, which constitute an important environmental protection measure, should be set up in due course. Nature preserves are nature in microcosm, which can restore or approach the pristine state of the natural world. Establishing nature reserves is significant in four respects.

A. Protecting species resources. The amount of virgin forest in the world has sharply decreased, from 5.5 billion hectares in the 19th century to 2.8 billion hectares. The number of biological species has been decreased by 5 to 10 million, including 250 animal species, and an additional 600 species are facing extinction. The number of plant species that have become extinct is even more shocking, already exceeding 1 million. It is estimated that by the end of the century an additional 10,000 species of higher plants will have disappeared from the earth. The situation in China is also serious. Currently, we have only 1.8 billion mu of forest land, with a cover rate of 12.7 percent, placing us 120th among 160 countries and areas worldwide. Without plants we cannot have animals. Nature preserves are natural areas which will preserve species resources and make them multiply.

B. Storehouses of Natural Resources. Nature is a storehouse stocked with every variety. As a result of natural or human factors, some species are declining or becoming altered or disappearing. It is reported that an average of one animal or plant species becomes extinct each day in the tropical forest. Certain plant species are in danger of extinction in China as well. For example, there are only four trees of the rare and valuable Baishanzu fir and only one Putuo hornbeam in Zhejiang (recently the Hangzhou Botanic Garden has managed to cultivate 10 seedlings), while the Zhoushanxin mu jiang [5297 1472 2450 2606 1603] is no longer to be found. In addition, there are now only two rongmao [4834 3029] honey locust, which 10 years ago was rather numerous in the southern peaks of the Hengshan Mountains in Hunan. Evolution cannot be repeated; if living things are not protected, their disappearance from the earth is irreparable; conversely, if they are properly protected and rationally utilized, living things are an inexhaustible resource.

C. Preserving Natural Environments. The environment in which man exists is actually a large ecosystem, and living things are an important factor in maintaining its balance. It is only because of their existence that the energy flow and the cycle of matter in nature is possible. Preserving nature and establishing nature preserves is acting in accordance with ecological laws and will preserve the natural environment. If a country's forest cover accounts for 30 percent of its total area and is uniformly distributed, this forms a rather suitable ecological environment.

D. Providing a Natural Background. Nature preserves are an excellent resource for observing and investigating the laws of development of ecological systems, for preserving and developing precious biological resources, and for introducing and domesticating natural biological varieties; in addition, they are areas for scientific research, production and teaching. Even more importantly, they provide a natural background for comparative purposes. They are living "museums" and "natural domains" for plant, animal and microbial species.

To summarize, nature preserves are extremely important for protecting, and rationally utilizing natural resources, maintaining and improving man's living environment, regulating climate, preserving soil and water, conserving water resources, promoting agricultural production, making the economy flourish, and developing science and education.

II. Establishing and maintaining nature preserves and their management systems is an urgent task for China in the next few years. In October 1979, the 15th session of the Parks and Nature Preserves Committee of the International Nature and Natural Resources Protection League, held in October 1979 in Australia, tentatively recognized the following 10 categories of nature preserves, to which we may refer when establishing and improving nature preserves in China.

1. Scientific research preserves (areas for ecological research); 2. Forest park nature preserves (such as the Zhangjiajie Forest Preserve in Dayong County, Hunan, which is a natural park with an area of 37,000 mu; 3. Natural heritage areas (such as the Lushan Glacier trace in Jiangxi and the Qixingyan and Hudiyan areas in Guilin); 4. Cultural antiquities areas (such as the Waste of Yin in Anyang, Henan, where the oracle bones were found, or the ruins of primitive society at Xi'an, Shanxi); 5. Multiuse resource areas (i.e., the use of multiuse economic forest resources for the national economy); 6. Natural biological areas (such as the Wolong Nature Preserve in Sichuan, with a combined function of preserving such rare animals as the panda and the Northwestern alpine forest ecological system); 7. Natural scenic zone preserves (such as the Dinghushan Nature Preserve in Daoyau County, Guangdong Province, which contains an area representative of the world's subtropical everygreen broadleaf monsoon forests); 8. Historic and archeological areas (such as Chin Shihuangdi's tumulus, 5 km east of the county seat of Lintong County, Shaanxi, with the world famous "Qin Burial Figures"); 9. Natural world cultural heritage areas (such as the Zhoukoudian area where Peking Man was excavated); 10. Management preserves (areas set up surrounding various types of preserves).

When China establishes nature preserves, we should take account of the fact that our forest cover rate is low, and focus on both the use and protection; we should include not only relatively pristine and well-preserved natural landscapes and ecological systems, but also landscapes with plant cover cultivated and protected by man to various degrees, and various types of landscapes and ecological systems. Internationally, the percentage of a national territory occupied by preserves is frequently taken as a measure of the level which its nature protection work has reached. For example, nature preserves account for 5 to 20 percent or more of the national territory in the United States, Japan, West Germany, Zaire, Kenya and Tanzania. In some countries the proportion of the total area occupied by nature preserves is small (e.g., the Soviet Union and Canada), but because of the large area of the country and the small population, large land areas are still in the pristine natural state.

In recent years many of China's environmental protection workers have made numerous constructive suggestions regarding the establishment of nature preserves. The layout of nature preserves in China is as shown in Fig. 1.

A. The core nature preserve area. This area should be a primitive, well-preserved natural landscape area. It must be representative of the natural landscape or large natural region to which it belongs and include a variety of pristine ecological systems. The core area must be stringently protected

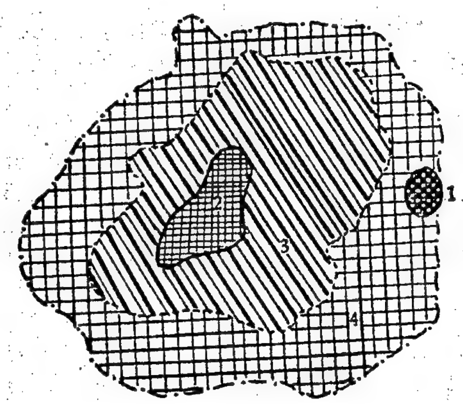

Fig. 1. Layout of Nature Preserves in China

Key:
1. Nature preserve management organs
2. Core area
3. Buffer area
4. Peripheral area (or experimental area)

to prevent human interference and damage. It may be a basic research area for scientific research on ecological systems and for clarification of the interrelationships between biotic and abiotic factors in ecological systems and between different ecological systems, and of their effect on the environment and development of the economy.

B. Buffer zones within natural preserves. These surround the core zones and can protect them from external influences. Various scientific experiments may be performed in them in accordance with real needs, while observing the principle of preserving pristine, undamaged ecological systems.

C. Nature preserve experimental areas. These are areas which have already been utilized or developed by man and are generally in the areas surrounding nature preserves. Based on the environmental characteristics of the area, they are planted with plant cover, produce their own characteristic products, and are used as a norm or for popularizing the recovery of plant cover in the area of the natural landscape to which they belong.

D. The nature preserve management bodies may be set up in the buffer zones or experimental zones.

Based on the plans for designation of nature preserves in China, a National Nature Preserve Designation Work Conference held in Chengdu in September 1980 suggested increasing the number of nature preserves to about 300. All provinces have now completed their nature preserve designation plans, and the nature preserve area has been expanded to 9.6 million hectares. Even so, the area of newly designated nature preserves amounts to only 1 percent of the national land area.

III. We venture to offer the following opinions about the bases, programs and methods for establishment of nature preserves in China.

The entire guiding idea in setting up nature preserves must be to establish suitable categories in terms of specific local conditions and the objectives and requirements of their establishment. The overall basis is to protect the country's natural environment and natural resources, and particularly to rescue and preserve certain endangered biological species.

The program for establishing nature preserves should include the following aspects: the area, scope and character of the preserves, protective measures, establishment objectives, structure, organization, leadership, and operating expenditures.

The methods of establishing nature preserves are as follows.

A. Four management levels can be distinguished. A first-level nature preserve is managed by the central government; such protected areas generally have an area of a million mu or more. Second-level nature preserves are managed by the provinces and have areas of several hundred thousand mu. Third-level nature preserves are managed by the prefectures, administrative offices or cities and have areas of 10,000 mu or more. Fourth-level nature preserves are run by the counties and have areas of 1,000 mu or more.

B. The following principles apply to establishing first-level nature preserves. 1. Nature preserves intended to protect an entire natural landscape must be large in area, embrace all of the diverse ecological systems, and have sufficient room for protected animals. 2. Nature preserves intended for the protection of some valuable plant or animal resource need not necessarily have large areas; this is determined on the basis of actual circumstances and needs. 3. China has many scenic and tourist areas, which are generally located with famous historical sites, as well as numerous small primeval forests and ancient trees of great attraction, which have become famous tourist locations; some of the areas also have scientific of educational value. Such areas generally will be managed by special management bodies.

C. We must take the long view, draft plans of a regional character, strive to make uncultivated hill areas flourish by planting vegetation and forests, and develop the forestry industry. If forests are effectively protected, in a matter of decades or a century manmade forests will turn into natural forests.

The following work must be done effectively in order to step up management and propaganda-education work with regard to nature preserves. a. The Environmental Protection Law and the Forest Law must be conscientiously implemented, propaganda on protecting natural resources must be intensified, unique, rare and endangered plants must be protected, and the natural ecological balance must be maintained. b. We must establish management organs and keep them effective, staff them with specialists, draft detailed operating regulations, and step up management work. c. We must pursue active

scientific research on unique, rare and endangered plants (the laws of their growth and development and techniques of breeding them), and make orientational observations on ecological systems. d. We must develop activities for the annual Tree Day, Bird Week, and Culture and Politeness Month. e. We must include knowledge related to environmental protection and nature protection in the elementary and middle school curriculum.

IV. The United Nations has established the following main research topics for international nature preserves: 1. tree cover and soils; 2. land forms; 3. characteristics of plant and animal areas and systems; 4. forms of protection; 5. damage caused by man.

We naturally must develop our own research methods with reference to foreign experience and in accordance with our own circumstances. In recent years, China has been pursuing research on nature preserves on an original basis. The number and depth of the topics varies from location to location. For example, the survey of 700,000-mu of primeval and second-growth forest in the Badagongshan area of northwestern Hunan conducted in August 1981 by the Hunan Scientific and Technical Committee and Scientific Society was a comprehensive scientific survey which covered such areas as geology, landforms, soils, plant cover, trees, medicinal plants, vertebrates, insects, climate, hydrology, and social and economic aspects in considerable detail. This comprehensive survey provided scientific data for establishing various types of nature preserves. Naturally, the research focuses will differ for different types of nature preserves; survey plans suited to the specific conditions must be drafted.

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8480
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LESSONS FROM AUGUST 1981 FLOOD IN SHAANXI

Beijing ZHONGGUO HUANJING KEXUE [ENVIRONMENTAL SCIENCES IN CHINA] in Chinese No 6, 21 Dec 83 pp 41-42

[Article by Zeng Yibing [2582 0001 0365]: Environmental Lessons From Flood in Southern Shaanxi, August 1981]

[Text] Between August and September 1981, the Qinling and Bashan areas of Shaanxi Province were hit by an exceptionally severe flood. Most of the rain fell in Ningqiang, Lüeyang, Liuba and Taibai Counties along the upper reaches of the Han Jiang and Jialing Jiang. On the worst day of the flood, over 100 mm of rain were dumped on seven counties. The swollen waters of the Han Jiang and Jialing Jiang burst their banks and caused serious damage to life and property. Apart from natural factors, the major reason for the flood was that as industry and agriculture developed and human activities intensified, the natural ecological balance was destroyed and the environment deteriorated.

Since the 1960's, industry and agriculture have been developing rapidly along the upper reaches of the Han Jiang and Jialing Jiang. Formerly a small town, Shuangshipu is now the political, economic and cultural center of Feng County. Because this piece of land is narrow, the city developed towards the rivers. Land was reclaimed from a lake to make room for the construction of nine units, including a Chinese medicine hospital and a factory producing sauces. As a result, the river course, originally 400 meters wide, was reduced to 90 meters. In addition, a sports field was built along the river, further pushing the embankment towards the center and taking up 15,000 sq. meters of the river bed. During the August '81 flood, the river burst its banks here, destroying the bridge at the bank of the river and caused devastating losses to the units along the river.

To produce food from the river, as much as 110,000 mu was reclaimed from the Han Jiang and Jialing Jiang, reducing the river course to one-half to one-third of its original width. Construction works at Longkou in Feng County, for instance, ignored the topographical conditions and the way the river took form. Arbitrarily the eliminating a curve here and straightening a bend there, they reduced the river trough from its original width of 300-400 meters to 70-100 meters. As the water level raised, the swollen river burst its banks and washed away both old and new beaches, sending a disastrous torrent downstream. The flood peak at Shuangshipu was increased, engulfing the county town in a vast expanse of water.

Although the volume of flood water was small, the losses were horrendous. One important reason for this was that the water bed was elevated and the water level therefore pushed higher. Hardest hit was the county seat of Lüeyang County. Over the past 20 years, the water bed of the Jialing Jiang rose by about one meter. The figures for Badu He and Dongdu He are two and three meters respectively. Along the Dongdu He, the soil is hard and the slopes firm. Conditions there do not encourage the formation of mud and rock flow, and soil erosion is relatively slight. Yet its river bed has been elevated three times that of the Jialing Jiang. The reason lies precisely in the fact that since the early 1960's, cement plants, the Lüeyang Steel Plant and several large mining areas have been built one after another. Together with other units such as the quarry run by the Daba production brigade, they discharge ino the Dongdu He 150 million tons of waste residual rocks annually. At present, many units regard rivers as the dumping sites of their "three wastes." It is estimated that the Han Jiang each year receives several million tons of wastes. Particularly devastating is the construction of railways and highways. The construction of Mianxi Station and Qingyang Post, for instance, levelled half a hill and sent a large quantity of waste residual rocks into the rivers. Other examples are Sandaowan in Mian County and Xingzishan in Zhenba. The excavation of roadbed for the construction of a kilometer of highway produces more than 20,000 tons of waste residual rocks. When the flood came, the Xiaoyang He alone was silted up to two meters. The Jingyang He, navigable by 3-5 ton junks in the 1950's, has now become a wading stream.

Many embankments burst because of the rise in the river bed. Records indicate that the flood peak in 1964 was 5,950 cu. meters per second. Although the highest peak in 1981 was only 4,280 cu. meters, it caused much more damage. For instance, the entire village of Xinjiezi was destroyed. For fours hours in 1964, that village was submerged in 0.5 meter waters. In 1983, it was buried in 1.2 meters of water for nine hours, with massive losses.

According to historical records, flooding has always been the major disaster in Feng County. Mudslides and landslides were only local affairs. However, in the August '81 disaster, mudslides and landslides were univeral. From Honghuapu to Shuangshipu, rock and mud flows occurred in about 90 percent of the tributaries on both sides of the Jialing Jiang. Along the An He, six of the seven canals up to Hekou Commune were silted. A large amount of mud and rocks rushed down the mountain canals, burying factories and villages, silting rivers, changing the course of rivers, elevating the water level, eroding river banks and washing away roads and railways. There were 92 landslides along the Fengzhou section of the Baocheng Railroad; the roadbed was damaged at 44 points. Ten large and medium-sized bridges were washed away, and three stations were buried, causing a two-month service disruption in the middle section of the railroad.

The Qinbashan area is geologically complex, with many faults and folds and numerous precipitous mountains. The schist, vulnerable to weathering, was soon reduced to broken pieces. During an extended period of rainfall, water accumulated on the ground and the runoff intensified. These natural conditions account for the outbreak of mud and rock flows. For several years, as agriculture and industry have developed, vegetation has been destroyed. During the August '81 flooding, the Gaoping Canal alone yielded enough rocks, sand and roots to bury plants and homes up to two meters. The losses were horrendous.

The fact is that the extent of a flood is closely related to ecological conditions and vegetation. We can tell from statistics that in the same rain-drenched region, areas that have few plants and mines, are sparsely populated and have a high cover of forest suffer less than areas that lack these conditions.

Vegetation plays an important part in reducing and preventing mud and rock flows. In addition, forests can retain a large amount of rainfall. In its pristine state, a forest is buttressed by its layer of fallen leaves and foliage which retain water five- to six-fold. The dead foliage also replenishes the groundwater, thereby influencing the hydrological condition and preventing surface runoff.

Forests, therefore, are the "sentry" and "doctor" of environmental protection. There is a walnut tree in Taiba County which is 10 meters tall, 30 meters in diameter and has roots extending 10 meters. During the August '81 flood, it effectively resisted the floodwaters, preserved 11 mu of land, and saved several houses.

In short, the key to flood prevention is river protection, sound treatment of industrial residue and afforestation.

12581
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NATIONAL FORUM URGES ACTION ON DWINDLING FORESTS

HK100901 Beijing JINGJI RIBAO in Chinese 26 Apr 84 p 2

[Report by Yi Nuo: "National Forum on Forestry Calls for a Stop to Indiscriminate Felling of Trees"]

[Text] In China, the area of land covered by forests is decreasing each year! It is necessary to eliminate stupid ideas about the value of forests! It is necessary to pay close attention to the structural reform of forestry and to science and technology in revitalizing forestry! This was the cry of warning of the experts and scholars attending the national forum on the development of forestry held in Beijing not long ago.

Liu Guangyuan, vice minister of forestry, said: In regard to the per capita area of forest, our country ranks 120th among the 160 or more countries and regions of the world. This is extremely incompatible with our socialist modernizations. At present, the area of land covered by forests is steadily decreasing. The results of the investigations conducted during the Fifth 5-Year Plan period show that there is a decrease of 90 million mu compared with that in the Fourth 5-Year Plan period. The quality of the forests is also declining.

The problem of excessive felling of trees is still very serious in the forest zones. The forest resources of some forest zones have been exhausted. As a result of the destruction of forests and pasture, the ecological calamities in some localities are becoming more and more serious. Xu Dixin, a noted economist and president of the ecological economics society, said that in the 5 years between the Fourth 5-Year Plan period and the Fifth 5-Year Plan period. the extend of our forests decreased each year and the amount of land covered by natural vegetation decreased from 12.7 percent to 12 percent of the total area of the country. This is really a shocking picture! There is an old saying: "It takes 10 years to grow trees, but a hundred to rear people." In fact, it should be turned the other way round, "it takes 100 years to grow trees, but only 10 to rear people." We cannot rear and educate people in 10 years, but we can in 20 years. It takes an even longer time to grow trees.

It is necessary to strive to deepend the people's understanding of the significance of afforestation. Luo Yuanzheng, executive chairman of the Federation of Economics Societies, said: The CPC Central Committee pays close attention to forestry from a strategic point of view. However, many comrades consider forests to be bases for timber production only. They understand the economic value but not the social value of forests. With the development of modern science and technology, new energy resources

and new materials steadily come into existence. They can replace the old energy resources and old materials.

However, the value of forests cannot be replaced by anything. If we pay attention only to technological innovations but not to improving the ecological environment, even if we can become an advanced country in the technological sense, we cannot really bring about the realization of the four modernizations. Thus, it is necessary to eliminate those stupid ideas about the value of forests.

How can we revitalize our forestry? Tong Dalin, a noted economist, said: It is necessary to gain experience in structural reform and in promoting science and technology and to popularize such experience. In this way, we can make a start in forestry. Wang Weisi, deputy chief of the Agriculture Bureau under the State Economic Commission, said that it is necessary to consider foresty and timber a special industry and a special product. In order to protect the forests, it is necessary to practice the policy of generous rewards, heavy fines, and high prices and to find substitutes for wood.

Xu Guozhong, chief engineer of the Forestry Industry Bureau under the Ministry of Forestry, suggested that it is necessary to pay close attention to reforming the planning and management systems in forestry, to change the situation of "lack of cooperation among departments and regions at different levels, of the separation of production and marketing, and of too many departments being in charge of planning," to invest more money in the development of forestry, to change the profit-centered way of assessing forestry enterprises, and to earnestly implement the principle of "basing ourselves on the development of forestry."

Those departments concerned with forestry stated their opinions at the forum. Ma Lintong of the Ministry of Coal Industry said that the country's coal mines consume several million cubic meters of mine timber each year. In recent years, the coal industry departments have vigorously built forests for mine timber with excellent results. Our problem is that there is little land for building forests. It is hoped that the departments in charge of forestry will solve this problem when they draw up plans. Li Wenzhi of the Society for the Study of Hydraulic Economics said that afforestation is an important measure for protecting water conservancy. It is hoped that departments in charge of water resources will pay close attention to afforestation when they draw up plans concerning drainage areas and other projects.

This forum was jointly held by the Federation of Economics Societies and the Forestry Economics Society for the purpose of disseminating the "Instructions Concerning the In-Depth and Conscientious Drive To Afforest the Motherland" issued by the CPC Central Committee and the State Council. Vice Chairman Wang Renzhong of the NPC Standing Committee attended the forum and made a speech. He stressed the need to relax the policies concerning forestry and to popularize the system of contracted responsibilities on the household or individual basis, which has proved to be effective in agricultural production.

CSO: 4008/313

LEADERS ATTEND BEIJING AFFORESTATION CONFERENCE

OW092137 Beijing XINHUA in English 1218 GMT 9 Mar 84

[Text] Beijing, March 9 (XINHUA) -- Chinese Vice-Premier Li Peng today called on Beijing residents to set an example for the whole country in the afforestation drive, which officially begins March 12 every year. Speaking at a meeting held by the Beijing Afforestation Committee this afternoon to award advanced units and individuals, he particularly urged government institutions under the central authorities and Army units stationed here to contribute more to the city's tree-planting activities.

Wang Xian, deputy director of the committee, said he looked forward to a still bigger expansion of afforestation in the Beijing area this year, which would involve all trades and residents.

Speaking of this year's plan, he noted that a 50-kilometer route from Beijing Airport in the east to the Capital iron and steel complex in the west would be flanked by trees and grass. The same would be done along a northern city moat and 15 major roads and in ten parks in the city.

Shelterbelts would also be built in Beijing's major suburban areas and mountainous regions and around reservoirs.

Reviewing the city's achievements last year, he said that 1.1 million trees were planted, 700,000 square meters of lawns added, and over 200 hectares of land brought under trees in compounds of government offices and industrial enterprises or on school campuses.

On the outskirts of Beijing, a total of 25 million trees were planted, 31,000 hectares of barren mountainsides and abandoned riverbeds covered with trees, 5,000 hectares of land sown to tree or grass seeds by aircraft, 2,700 hectares of orchards and 6,300 hectares of pasture added last year, Wang said.

Roughly 4.5 million people in the Beijing area turned out to plant trees last year.

Today's meeting was attended by more than 6,000 people including Vice-Premier Li Peng, other Chinese leaders Hu Qili and Hao Jianxiu, and Mayor of Beijing Chen Xitong.

A total of 511 outstanding units, including government offices, factories, research institutions, schools and neighborhood committees, and 733 outstanding individuals including cadres, workers, peasants, teachers, scientists and technicians, received citations and souvenirs at the meeting. [Beijing XINHUA Domestic Service in Chinese at 1537 GMT on 9 March carries a report on this meeting which adds the following: "Vice Premier Wan Li, chairman of the Central Greening Commission, wrote an inscription for the meeting. Hu Qili, Hao Jianxiu, Wang Zhong, Hong Xuezhi, Yang Jingren, He Zhengwen, Fan Ziyu, Duan Junyi, Yang Zhong, and Jiao Ruoyu attended the meeting."]

CSO: 4010/82

EDITORIAL STRESSES DEVELOPMENT OF AFFORESTATION

HK150331 Beijing RENMIN RIBAO in Chinese 12 Mar 84 p 1

[Editorial: "The Country Is Getting Greener and Greener Each Year"]

[Text] Today is the fifth Arbor Day of our great socialist motherland. Hundreds and millions of people throughout the country will celebrate this festival, which is of great significance, with their own actions by making exerted efforts to plant trees and grow grass.

Launching a mass campaign to cover the motherland with greenery is an important measure for raising the tree cover of China's land mass and creating a sound ecological environment for our nation. It is of great strategic significance, whether to the realization of the objective of quadrupling the gross output value of industrial and agricultural production by the end of this century, to the prosperity of the country and the happiness of the people, or to the existence and development of our coming generations. In the situation at present in which China's rate of plant cover is low and its greening task is extremely arduous, it is entirely necessary and effective to arouse the broad masses in an organized and properly guided way to carry out a sustained and down-to-earth campaign of planting trees and growing grass and flowers year after year. In order to continue to advance this campaign and to carry it out in a more satisfactory way each year, we must stress concentrating our strenuous efforts on the "down-to-earth manner" in which this campaign is being conducted.

To make a success of our work in all fields, we must start with being down-to-earth in everything and emphasizing practical results, and we must make particular efforts to conduct this campaign of covering the country with more trees in such a way. In a very long period of time in the past, China planted a considerable number of trees each year but the survival rate was not high or although trees were planted, they hardly grew luxuriantly. Aside from the lack of stable forestry rights and a strict legal system, one important reason for this state of affairs was out failure to do a solid job, to pay attention to the use of science, and to stress practical results. For example, in afforestation we concentrated exclusively on quantity to the neglect of quality; when planting trees, we did the work "in a massive and unplanned way" and after planting trees, no one was left responsible for taking good care of the trees; and in some places false reports on planted trees were not uncommon.

In the places where afforestation was not carried out in a down-to-earth manner, although the call was shouted year after year to cover the country with greenery and to "pay close attention" to greening work, the greening work was mostly carried out perfunctorily. The masses described the greening work carried out in this way as "batch upon batch of trees are planted in spring but they disappear in autumn and another drive has to be repeated in the coming year." This conducting of greening work is not only a waste of manpower and financial and material resources, but has caused delay. As a consequence, the old scenes of China's afforestation remain unchanged. This formalistic work style and proneness to boasting and exaggeration which ignore practical results have remained influential with some comrades up to now and presented major obstacles to the in-depth development of the greening campaign. They must be removed resolutely. A solid job must be done in greening work. It is hoped that cadres at various levels and leading cadres in particular should bring about an earnest turn for the better in their thinking and work style and do a good, solid job in the organization work of the greening campaign in terms of ideology, policy, and material. What is most important at present is to go deep into the realities of life and to implement the CPC Central Committee and the State Council "Directive on Conducting the Campaign of Covering the Motherland With Greenery in a Thorough and Down-to-Earth Manner" which was transmitted not long ago item by item.

All formalistic practices, such as "doing things in a massive and unplanned way" and "concentrating on flourishes while working," must be stopped. Most importantly, we must relax party policy, ascertain everybody's specific responsibilities, use science in planting trees and growing grass, and raise the level of afforestation. We must respect science, act honestly according to objective laws, and strive to combine our enthusiasm for covering the motherland with greenery with a scientific approach. First of all, we must work out a scientific greening plan which is in conformity with both natural and economic laws in the light of the characteristics of local natural environment and socioeconomic conditions.

This plan must implement the principle of carrying out tree planting in line with local conditions and in good time and with appropriate methods. Whether to plant trees or bushes or to grow grass hinges on actual conditions. It must pay attention to the rational distribution of different forests and different trees, that is, it is necessary to plant timber forests, economic forests, fuel forests, protective forests, and special forests simultaneously. It must not only introduce from other regions genetically improved strains of trees but develop local species and must also pay attention to planting mixed forests. It is necessary to attach importance to bringing the role of intellectuals into play, to strengthen the scientific and technical guidance toward greening work, and to do a good job of technical service and popularize scientific and technical knowledge by relying on forestry technical personnel so that cadres and the masses can understand the scientific hows and whys of planting trees and growing grass.

From now to the end of this century, there are only about 16 years to go. The objective of covering the motherland with greenery is magnificent but arduous.

However, we have a lot of favorable conditions and the common determination and courage of generation after generation which can rapidly change the motherland's natural features. Only when we press forward in the face of difficulties, make unremitting efforts, and carry out the mass campaign of covering the motherland with greenery in a more down-to-earth manner with each passing day can we ensure our country becomes greener and greener each year. Working for 16 years, we can surely make our motherland's vast land, which is as beautiful as brocade, more beautiful.

CSO: 4008/206

WAN LI SPEECH STRESSES AFFORESTATION

HK221031 Beijing RENMIN RIBAO in Chinese 19 Feb 84 pp 1, 2

[XINHUA Report: "Wan Li's Speech to Third Plenary Session of Central Greening Committee (18 February 1984)"]

[Text] Comrades, today is the opening of the Third Plenary Session of the Central Greening Committee. At this plenary session, we have heard reports by the Ministry of Forestry, the Ministry of Urban and Rural Construction and Environmental Protection, and the Army's Greening Committee and discussed and approved three things: first, the formation of a "China Greening Foundation." This was proposed by a returned Overseas Chinese compatriot. We have accepted this proposal. In this way, we can gratify the desire of those who are at home or abroad who would like to contribute money to our cause of afforesting the country. Second, we discussed and approved the design of the "emblem of China's Afforestation Day." And third, we approved the list of the advanced units to be commended for voluntarily planting trees for the people of the whole country. Some of these units are in the rural areas, some in the cities, some are under the Army, while others are government or party departments. They should be commended for their outstanding achievements in launching the drive to encourage all the people to voluntarily plant trees. We should emulate them.

Now, I would like to present my views on the question of how to more thoroughly and solidly launch the drive to afforest the motherland.

I. Discuss the Question of Understanding First

In January last year, at the National Conference on Voluntary Afforestation by the Whole Nation and All the People, I said the drive of the whole people to voluntarily plant trees is not an economic issue nor a problem of the building of spiritual civilization when there is the problem of the environment in which the human race exists. The suitability of the environment is of vital importance to the existence of the human race and its life span. At that time, we agreed on this view. Many scientists have repeatedly discussed and studied this problem and we have conducted comprehensive propaganda throughout the country. Consequently, out understanding has greatly improved. Today, I will dwell no more on the relationship between afforestation and ecology.

Now, I would like to discuss an urgent problem in afforesting the motherland.

The 12th CPC National Congress suggested creating a new situation in socialist construction and in quadrupling the gross annual industrial and agricultural output value by the end of this century. This is a magnificient goal embodying the desire of people of the whole country. Our country is deficient in forest resources. Only 12 percent

of the land is covered by natural vegetation and there is a shortage of firewood. Can we not change the siutuation? Many comrades are aware of this. They think that the two two major mistakes in administering agriculture in the past were that we overlooked mountains as well as water resources. In the future, in order to quadruple agricultural output, it is necessary to pay close attention to the mountains, to study well the "Book of Mountains, Seas, and Rivers," and to paint a beautiful "picture of mountains, seas, and rivers." This understanding is a valuable one which can be attained only by experiencing complicated situations over the years and paying a price. We must speedily turn this great leap forward in understanding into common understanding and actual action of the whole party and the people throughout the country. The cause of making the country green by planting trees cannot be successful unless prolonged and arduous efforts are devoted to it. It is necessary to resolve to take action as early as possible. Otherwise, many years will have elapsed before anything is done. Leaders at all levels should have this farsightedness and sagacity.

They must not pay attention only to immediate problems and ignore long-term problems. The cause of making the country green by planting trees is a long-term construction project as well as an urgent task. Hesitation can only forfeit chances. Many comrades know that the Gaoxigou brigade in Mizhi County, Shaanxi Province, was an area with serious soil erosion. As a result of awareness of the problem at an early date and quick action taken by people, from 1958 on, the "three one-thirds system" has been put into practice in distributing land for agriculture, forestry, and animal husbandry, and trees and grass have been extensively planted. In several decades, there have been radical changes in its physical features and economic conditions. In 1977, during a rainstorm which had successively brought a rainfall of more than 200 mm, there was neither a landslide nor flood. However, in the Jiuyuangou brigade, which was in the vicinity and which had very little vegetation cover, more than 200 dams were damaged by the flood. Having made preparations for 2 years, Yu County in Henan last year grew more than 20,000 mu of seedlings and planted more than 8 million trees, an increase of more than 200 percent over 1982. In addition, a new network of trees covering an area of more than 900,000 mu was built. It has basically accomplished the task of building networks of trees around the cultivated land in the plains.

Zhangye County in Gansu Province began to establish forests in the 1970's. It has plnated trees along roads and irrigation channels with a total length of more than 100,000 kilometers and build networks of trees around 70 percent of its cultivated land. Consequently, its microclimate has notably improved, wind speed has dropped, and arid, hot gusts have become less frequent. Compared with output in 1970, in 1980 grain output increased by 75 percent, the number of draft animals increased 26 percent, and the number of goats and sheep increased by 124 percent. Lumbering began in 1976. About 250,000 cubic meters of timber has been produced. Ju County in Shandong has extensively planted poplar trees, which have quickly grown into high-yield forests. The trees can grow into forests in 2 years. In 3 or 5 years, the trees will be about the size of purlins and in 7 or 8 years, the trees will be about the size of roof beams. The country has more than 200 counties which are as successful as the above ones and the number of advanced communes and brigades is even greater. These facts show that as long as we are farsighted, pay attention promptly, and devote appropriate efforts, we can achieve remarkable economic and ecological results and change the look of the country in quite a short time, that is, in 3 to 5 years at least and in 10 to 20 years at most.

In making the country green by planting trees, we must broaden our field of vision. To afforest does not mean only to plant trees. It is also necessary to grow grass and flowers. To plant trees does not mean only to plant tall trees. It is also necessary to grow shrubs. We must build not only timber forests but also economic forests, fuel

forests, shelter forests, scenic forests, and so on. In arid or semi-arid areas or in areas with serious soil erosion, such as those in northwest China, it is necessary to grow shrubs and grass first and to combine biological measures with mechanical measures. The methods of building forests should be varied and in line with local conditions. Wherever the hillsides and sandy areas can be closed in order to facilitate afforestation and the growing of grass, they should be closed. In the vast and sparsely populated areas, if circumstances permit, we can use airplanes to sow seeds or sow tree or grass seeds by other artificial means.

In short, in regard to the cause of making the motherland green by planting trees, we should have a sense of urgency and responsibility. It is necessary to strengthen scientific research, to speedily draw up plans according to the actual circumstances in various localities, to implement various policies, to strengthen prevention of plant diseases and insect pests by biological means, and, by various means, to cover more parts of the country with green plants, in order to change the look of the country.

2. On Making Policies Less Restrictive

Concerning the policies governing forestry, many stipulations have been made since the 3d Plenary Session of the 11th CPC Central Committee. Document No 1 issued by the Central Committee this year also makes mention of this issue. Recently, the CPC Central Committee and the State Council have made some new stipulations. They are about to issue some instructions on thoroughly and solidly launching the drive to make the motherland green by planting trees. The gist is to continue to make the policies less restrictive, revitalize the economies of the mountain areas, and speed up afforestation.

In recent years, with the implementation of the "Decisions on Forestry" made by the central authorities and the enforcement of the relevant policies and regulations, we have delimited 250 million mu of private hillside plots for 5,000 peasant households, 80 percent of the communes and brigades have been given the right to harness mountains and forests, the system of responsibilities for forestry has been put into practice, a number of key and specialized households going in for forestry and some integrated bodies of forestry have emerged, and there has been new vigor in the production and construction in forestry.

However, it can be seen from the general situation that more can be done to make the policies even less restrictive. In the past, there were many "leftist" things in forestry. We have removed some of them in recent years. However, others, which are still worrying the masses, remain to be removed. To us, the question of how to develop the mountain areas is to a very large extent a realm of necessity. Many problems remain for us to study. In all these years since the founding of the country, although we have built some forests and have conserved 420 million mu of trees, much waste hillside land and many beaches have not been developed with our abundant manpower. Why? Why have the masses in the mountain areas not become rich? Why do some of them still live in distitution? These questions cannot but give us much food for thought. To afforest waste hillside land and develop beaches is an exploitative undertaking. The task is arduous. Although much investment is required, we cannot make a profit in a short time. We cannot rely solely on the efforts of the state. It is necessary to rely on the masses and to mobilize them to do the job. If we cannot solve the problem of combining the laborers with economic interests by readjusting the policies, we cannot easily make any success. Thus, the policy concerning development of waste hillside land and afforestation should be made even less restrictive. Whether or not we have adequately made our policies less restrictive and whether or not our policies are cor-

rect are indicated by whether or not the enthusiasm of the masses has been aroused, whether or not they enthusiastically invest in waste hillside land and waste beaches, offer advice, and contribute labor to developing such land, and whether or not they earnestly protect the growth of trees, grass, and flowers. We should support with our enthusiasm the new things which have emerged in various parts of the country and this spirit of reform. For example, Comrade Chen Jusheng of Jingde County, Anhui Province, voluntarily asked for leave without pay in order to assume contracted responsibilities for 5,000 mu of waste hillside land; Comrade Li Jinyao of Xianyou County, Fujian Province, pooled funds and invited partners to establish and run a forestry center with an area of more than 1,000 mu. Their foresight and sagacity and their courage to run risks in transforming the country are praiseworthy and should be promoted. In assuming contracted responsibilities for vast areas of waste hillside land, they are in need of much manpower and capital and they want some helpers. Regarding this, we must adopt a clear-cut attitude and special policies. They can hire laborers or run their business with partners. Remuneration can be reckoned and shared among the partners according to work. Differences in wages are permitted. This way of doing things is different from the exploitation of hired laborers in the old society. In areas with soil erosion, we can allow larger groups to assume contracted responsibilities for tackling the problem according to the size of the areas drained by small rivers.

We can encourage establishment of family or cooperative forestry centers, nurseries, orchards, tea plantations, and so on. As for these contractors and those key and specialized households who go in for forestry, we should respect their right to make decisions on their business and protect their proper rights and interests. No unit or individual is to infringe on their proper rights and interests. Let them have a free hand in their work so that they can plant trees and grass, and harness the mountains, rivers, lakes, and so on in order to benefit both the country and the people.

At present, people living in mountain areas are still quite poor. In order to make them become rich as soon as possible, it is necessary to enliven the economies of the mountain areas. In enlivening the economies of the mountain areas, there is also the problem of making the policies less restrictive. In implementing the "overall" lumbering plans in the forest zones, it is necessary to leave the communes and brigades with an appropriate quantity of timber. This timber, as well as the trees felled during the tending period, the trees which make the mountains inaccessible, the small trees, and the semi-finished productions made of them should be exchanged for grain or other goods with other parts of the country, or sold under unified arrangements made by the county forestry departments or the commercial units they entrust with the responsibility. Most of the profits made should go to the peasants who grew the trees. In this way, the strange phenomenon of "the trees rooting in the mountains and the people living in destitution by staying at home" can be eliminated. Of course, arbitrary felling of trees is prohibited.

3. On Strengthening Leadership

To afforest the motherland is a great undertaking for administering our land and for benefiting future generations. In addition, it is also one of our basic national policies. The whole party should regard it as a major issue. As far as the central authorities are concerned, Comrade Deng Xiaoping personally pays attention to this issue and it was he who called for launching a drive among the people of the whole country to let them voluntarily plant trees. Later, he instructed that "this thing should be persistently done for 20 years and should be better and better and more and more solidly done each year." Not long ago, braving the rain, he and Comrade Wang Zhen planted trees in Xiamen. Comrade Hu Yaobang talks about afforestation every year. Last year he went to northwest China. He vigorously talked about the importance of afforestation all the way.

He asked the people there to break conventions and mobilized young people of the whole country to collect tree and grass seeds. He effected a breakthrough overnight. President Li Xiannian and Premier Zhao Ziyang also attach great importance to forestry and they have made many important speeches. At the end of last year, Premier Zhao wrote to the leading comrades of the Ministry of Forestry, recommending Yu County's experience in afforestation. The central authorities have decided to entrust party committees and governments at all levels and leaders of all units with the responsibility for planting trees and grasses and making the motherland green by planting trees. At present, there is still the need to reiterate this decision. This is to become a duty and an important criterion for assessing the work of the leading cadres. Party, government, and Army leaders at all levels should take the lead in planting trees and grass. They should earnestly attend to the work several times a year, conscientiously solve problems in the work, and complete the task of afforestation according to existing plans.

All are held responsible for the development or decline of forestry. To make the motherland green by planting trees is not only the business of forestry, agricultural, and urban construction departments. Cities, townships, and so on, and various departments also should take important responsibilities. Railroad, communications, hydroelectric power, agriculture and reclamation, coal, metallurgical, and oil departments in particular are responsible for the arduous task of making their premises green by planting trees.

It is necessary not to do work in a perfunctory or mechanical way. It is necessary to avoid wasting manpower and financial and material resources, to do a good job of drawing up plans, to pay close attention to building nurseries, and to keep enough seeds and seedlings in stock. It is necessary to do organizational work well, to strengthen inspection and checking before acceptance, and to commend, criticize, encourage, and punish those who should be commended, criticized, encouraged, or punished accordingly. It is necessary to make sure that all areas with trees and grass planted on them will be enlivened by the trees and the grass and that all the mountains and hills will become green after afforestation.

Spring has arrived and it is time for planting trees. Areas in the south should lose no time in taking action. Other parts of the country should make preparations for action as soon as possible. After the transmission of the instructions on afforestation issued by the CPC Central Committee and the State Council to lower levels, the whole country should properly organize studies and propaganda, improve understanding, implement the policies concerning forestry and the plans concerning the planting of trees and grass, further organize and mobilize the people of all nationalities to forge ahead in spite of difficulties, continue to work hard in a down-to-earth manner, and make new contributions to making our great socialist motherland green by planting trees, and to bringing about the realization of the goal of quadrupling the agricultural output value.

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RENMIN RIBAO URGES INCREASED AFFORESTATION

HK231210 Beijing RENMIN RIBAO in Chinese 17 Feb 84 p 1

[Editorial: "Relax Policy on Forestry, Step Up Afforestation of Barren Hills"]

[Text] A Chinese saying goes: "Late February is a good season for tree planting." In spring 1984, provinces in south China have been conducting afforestation activities one after another. It is reported that in various places the masses have great drive to plant trees. To make further progress and breakthroughs in forestry development this year, we must further relax party policy, boost the masses' enthusiasm, and strive to fulfill the various tasks such as tree planting, grass growing, seed selection, tendering of young growth, and rejuvenation of old growth in an overall manner and at top speed and must ensure high quality and best results in this respect.

Since the 3d Plenary Session of the 11th CPC Central Committee, the CPC Central Committee, the CPC Central Committee and the State Council have formulated many important policy decisions for restoring and developing forestry. For example, they have expressly announced that the policy on mountains for private use or mountains assigned to the peasants under a responsibility system has been relaxed; that the agricultural system of contracted responsibilities with payment linked to output should be introduced inforestry; and that it is necessary to resolutely depend on the peasants' own efforts in developing forestry to accelerate the process of covering the motherland with greenery. The various CPC Central Committee principles and policies have brought about significant results. Afforestation work throughout the country last year increased by 25 percent over the previous year, and afforestation via aerial seed sowing increased by 100 percent; and the survival rate in general was higher than in former years. This proves that the CPC Central Committee's policies conform to the common aspirations of the people, tally with national conditions and provide a correct path for rejuvenating China's forestry.

Party committees and people's governments at various levels have done a lot of work in implementing the principles and policies of the central authorities on forestry and scored marked achievements.

However, the party committees and people's governments in some places have failed to carry out party policy to the utmost extent. Consequently, policies which should be relaxed have not yet been completely implemented. This state of affairs is shown primarily in the follwoing: Tighter and stricter measures are applied in distributing mountain areas among peasant households for private use, and peasant households have not received significant enough amounts of hilly land; in some places, peasants want to contract for more barren hills and waste beaches and are willing to invest and develop them, but some cadres have imposed various restrictions on the peasants and repeatedly set up ceilings; some places lack boldness in carrying out the policy on benefits from forest trees and fear that the households engaged in forestry will make a fortune, that those who take the lead in this respect will get more money, and that the specialized households and key households will become immensely wealthy; and some places exercise rigid controls in invigorating the economy in mountain areas. All these problems have seriously hindered the development of forestry and should therefore be solved as quickly as possible.

At present, the situation in the countryside is excellent and the peasants' enthusiasm for developing production is rising higher and higher. This, coupled with money and grain in their hands and surplus manpower, has provided the peasants with a favorable opportunity to make all out efforts to carry out exploitative production and construction. Cadres at all levels, leading cadres in particular, must adapt themselves to the new developments, free themselves from the trammels of convention, further have their hands and feet unfettered, be a bit more determined in work, and give the peasants more preferential treatment and a freer hand in their production and work. All measures and methods conducive to the acceleration of the drive to cover the country with greenery are allowed to be carried out on an experimental basis, and experiences which have been proved effective by practice must be affirmed and popularized. Forestry work requires a lot of arduous effort; furthermore, it will hardly be crowned with any tangible results in a brief space of time. Without the spirit of perseverance and the courage to press ahead in the face of difficulties, one will accomplish nothing in this respect. We must broaden our field of vision, think of everything from a long-term point of view, dare to explore and constantly create a new situation in forestry construction.

The hard nut to crack in the drive to cover the motherland with greenery is how to transform the billion-some mu of barren hills and waste beaches. To complete this task successfully, the state, first of all, should not monopolize everthing. Second, the methods of "doing things with a great flourish" and eating "from the same big pot" should not be applied in this respect. The best way is to assign barren hills and waste beaches to the masses under a contract system, to rely on the efforts of 800 million peasants, and to uphold the principle that those who make investments in and operate barren hills and waste beaches are entitled to benefit from them. This is a feasible, effective, and sound strategy. Therefore, in our efforts to relax and implement party policy, the pressing matter of the moment is to pay close attention to making a success of the work of assigning the "private and responsibility mountains" to peasant households.

In places where mountains for private use have not yet been distributed as required by party policy and there are still barren hills to distribute, greater efforts should be made to distribute them among the masses who want to contract for more hilly land. In places where barren hills are scanty, it is necessary to be willing to distribute nearby mountains, fertile mountains, and mountains with defective forests among the masses as mountains for private use. In these places, it is encouraged to distribute all or the greater part of barren hills and waste beaches among the masses as mountains for private use and no, or fewer, barren hills and waste beaches should be distributed as responsibility mountains.

It is necessary to register the barren hills and waste beaches which have been delimited but not yet been assisgned to the right owners, to make definite the four boudaries of the private or responsibility mountains, and to issue certificates to the owners. As for the barren hills and waste beaches outside private mountains, as long as people wish to contract for them and have the conditions to do so, they must be allowed to contract for them to the extent they wish, with a longer time limit for land use and preferential treatment. Places with many barren hills with no possibilities for afforestation in the near future are encouraged to invite people from outside to contract for them or to develop their barren hills together with them in the form of compensatory trade.

It is necessary to vigorously support forestry specialized households and key households and to enthusiastically encourage them to carry out exploitative production and construction. As for those who are far-sighted, highly skilled, and bold in doing pioneering work with their investment, it is necessary to adopt some special methods to make things convenient for them and to allow them to raise funds and invite partners to contact for large tracts of barren hills and waste beaches and also necessary to encourage them to uphold the principle of distribution according to work done, with differences in payment being allowed. Provided that they observe rules and abide by the law and become better off through hard labor, nobody shall infringe upon their interests. As far as the staff and workers and technicians inside or outside the forestry departments and their affiliated organizations who voluntarily contribute their youth and wisdom to the rejuvenation of China's foresty are concerned, they are allowed to go to their native places with their positions preserved but wages suspended and allowed to sign technical guidance contracts with specialized households and key households to bring into full play their cultural and technical specialities. Forestry specialized households and key households are a new thing with great vitality. At present they are the pioneers in developing barren hills and building mountain areas and will become an important contingent of commodity producers in forestry and sideline occupations in the future. They are allowed to leave agricultural production if they willingly wish to, and allowed to specialize in or primarily engage in forestry production.

State-run forestry centers and those run collectively by the communes and their subdivisions must earnestly reform operations and management and introduce the system of contracted responsibilities with payment linked to output. Their production tasks are also allowed to be assigned to production teams or groups or assigned directly to their own staff and workers and the nearby masses under a contract system. With respect to large tracts of economic forests, bamboo forests, belt forests, and timber forests owned by the collective, some localities have adopted such operational methods as inviting shareholders in running forestry productive cooperatives or organizing other forms of forestry economic combines. This is a creative undertaking which should be encouraged and supported.

Relaxing and implementing party policy on forestry is an in-depth and continuous reform of forestry. We must adopt various vivid and vigorous forms to give wide publicity to the party and state policy on forestry to enable it to strike root in the hearts of the people. We must develop forestry production by relying on correct party policy and start a new upsurge of covering the motherland with greenery.

CSO: 4008/206

WANG ENMAO AT XINJIANG AFFORESTATION MEETING

HK100553 Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 9 Mar 84

[Excerpts] The third enlarged session of the regional Afforestation Committee, which concluded today, made the following arrangements for the region's afforestation in 1984:

1. Party committee and government officials at various levels should deepen their understanding, emancipate their mind, strengthen leadership, fully arouse the initiative of all levels, depend on the broad masses of people, and work hard over a long period of time so that instructions of the party Central Committee will really guide the Army and the people of all our nationalities in their effort to make Xinjiang green.

2. The forestry policy should be made more flexible, and the principle of encouraging the concerted effort of the individual, the collective, and state in afforestation, with stress on the individual, should be upheld. Special attention must be given to the bases for voluntary afforestation, wasteland distributed to commune members for afforestation, and the forested areas contracted to specialized households. We should be bold in designating more land to commune members for afforestation. Local authorities, if possible, should not be unwilling to distribute more forested areas or even good land on mountainsides to the masses, and the distributed acreage should not be strictly limited.

3. We must broaden our vision and increase the variety of trees, grass, and flower seedlings and facilities for the vigorous development of afforestation.

4. Feasible plans should be worked out. All localities should select some key units especially responsible for afforestation, link afforestation with the rural construction in five fields and the construction of forested districts in cities, and combine afforestation and the beautification of environments with economic results. All land designated for afforestation should not be used for other purposes, and the practice of indiscriminately occupying the land designated for afforestation should be checked immediately.

The meeting also commended 123 advanced units in the afforestation drive.

Those who took the floor at the meeting were Wang Enmao, first secretary of the regional CPC Committee and chairman of the regional Afforestation Committee; Ismail Amat, secretary of the regional CPC Committee and chairman of the region; Li Jiayu, secretary of the regional CPC Committee; and Yusufu Muhanmode.

CSO: 4008/206

YUNNAN STRESSES EXPANDING AFFORESTATION WORK

Kunming PLA Meeting

HK061012 Kunming Yunnan Provincial Service in Mandarin 1100 GMT 5 Mar 84

[Text] On the afternoon of 3 March, the Kunming PLA units held a telephone conference on afforestation. The conference formulated this year's afforestation tasks for the PLA units in the military district. Zhang Zhixiu, commander of the Kunming PLA units, put forward this year's afforestation tasks for the PLA units in connection with the actual conditions of the PLA units in carrying out afforestation work.

Comrade Zhang Zhixiu stressed: CPC Committees of all units under the military district authorities must strengthen their leadership over afforestation work. Making full use of the natural advantages of the province, we should widen our field of vision on afforestation and stress the quality of the work.

We should strengthen our propaganda and educational work as well as the work of assessment and checking. On the basis of doing the work in a down-to-earth manner, we should resolutely put much effort into this work. We should plant a tree and make it grow well; plant a tract of woods and make it become a forest; and afforest a hill and make it green. We should work steadily and make solid progress in achieving success in first planting trees; second, in afforestation; and third, self-reliance in work. We should create a new situation in the Kunming PLA units' afforestation work.

Comrade Zhang Zhixiu also urged: Units that have the conditions must plant as many trees as possible and voluntarily shoulder the work of afforesting the nearby areas within 20 li of the places where they are stationed.

Provincial Forestry Conference

HK080803 Kunming Provincial Service in Mandarin 2300 GMT 7 Mar 84

[Excerpts] Yesterday [7 March] at the provincial conference on forestry, Governor Pu Chaozhu made an important report on the development of our province's forestry. He proposed: Yunnan has much to do in the mountains and must vigorously grow grass and plant trees. We must exploit and build the mountainous areas in an all-round way. We must be resolved to take about 10 to 15 years to build Yunnan into a base of forestry and animal husbandry. Governor Pu Chaozhu talked about four aspects of the work:

1. In connection with the general aim, from the high plane of economic strategy we must understand the important significance of exploiting the mountainous areas and

developing forestry. Our province is a multinational mountainous province in the border area and has four economic advantages which have been long formed. Governor Pu Chaozhu said: We must formulate a strategy to develop the economy in Yunnan, proceeding from the general aim of quadrupling the gross industrial and agricultural output value, building the two civilizations, and achieving the three big tasks. In light of the actual situation in Yunnan, we must do a great deal of work on the mountains and must vigorously grow grass and plant trees.

2. It is necessary to disseminate the actual situation and experiences in forestry work. Governor Pu Chaozhu reviewed the situation in the development of forestry in the whole province the past few years. Now the whole province has allocated some 210 million mu of mountains and forest land to households. Last year 4.45 million mu was afforested. The situation in the development of forestry was very good. However, we must see that although mountains and forest land have been allocated to households, this does not mean that all problems in developing forestry have been solved. We still have much work to do.

3. Regarding policy and measures, Governor Pu Chaozhu demanded: All places must seriously solve the problems left over after the private mountains and responsibility mountains have been allocated to households. They must vigorously reform timber production and management. [passage indistinct] Regarding the problems of how to enliven the economy in the mountainous areas and of developing commodity production, Governor Pu Chaozhu said: The peasants cannot rely merely on farmland and timber to get rich. The key is to vigorously develop the processing trade and take the development road of the comprehensive utilization of forestry, industry, and commerce.

The fourth aspect of work which Governor Pu Chaozhu dealt with is opening up a new road in forestry. To create a new situation, it is imperative to strengthen leadership.

CSO: 4008/206

ZHAO ZIYANG HAILS HENAN AFFORESTATION

OW160043 Beijing XINHUA Domestic Service in Chinese 0952 GMT 15 Feb 84

[Text] Beijing, 15 Feb (XINHUA) -- Premier Zhao Ziyang recently wrote a letter to the leading comrades of the Ministry of Forestry praising the success achieved by Henan's Yu County, which has built a 1-million-mu network of trees on its cropland within 1 year. The premier said the country's experience is worth emulating by other counties.

Premier Zhao Ziyang said in his letter that he was highly delighted and inspired by the county's afforestation success achieved during the year. He said: We can see from this example that there is great potential for the afforestation of flatlands.

Premier Zhao pointed out in his letter: "An important reason why Yu County, which is situated on a plain, was able to complete afforestation during the year is because the whole county, from leading departments to grassroot units, had long been prepared ideologically, organizationally, and materially for the project. While disseminating the county's experiences, we should focus primarily on how it accomplished the project in a down-to-earth manner. We should neither speak in generalities and call on people to complete afforestation within 1 year, nor should we mobilize the people to visit the county, lest this cause ill effects. Our previous experiences show that while we were often successful in disseminating good experiences in a few selected units, the task tended to become formalistic when carried out on a large scale. This lesson must be kept in mind."

Premier Zhao's letter continues: "It is hoped that the Ministry of Forestry will select a dozen or so counties to follow Yu County's example, making sure the project is well planned and strictly followed in order to make afforestation a success. In terms of measures, the project should be started at several communes or townships, and then expanded to other areas. It is hoped that fruitful results can be achieved as quickly as possible, and that our land can be afforested in a more down-to-earth and successful manner."

According to a report from Henan, over the past year the party committee and government of Yu County, Henan, worked in a down-to-earth manner in leading the people of the county to plant trees and, during the year, planted between their croplands 8.52 million paulownia, phoenix, and tung trees, or 5 times more than in 1982, thus forming a tree network of 1 million mu. Now, 90 percent of the county's land suitable for trees -- or 8 times that of the woodlands that had been preserved by 1982 -- has been afforested. Today, the shoulders of the county's 2,100 roads and paths and both sides of the county's 959 ditches have been afforested. The county's goal of building a network of trees on its croplands has been realized within 1 year.

CSO: 4008/206

CYL TO BUILD SHELTERBELT ALONG HUANG HE

OW280820 Beijing XINHUA in English 0754 GMT 28 Feb 84

[Text] Beijing, February 28 (XINHUA) -- The Chinese Communist Youth League Central Committee, the Ministry of Forestry and the Ministry of Water Resources and Electric Power have decided to organize young people to build a shelterbelt along the Yellow River.

The project will cover six provinces and autonomous regions: Shaanxi, Shanxi, Henan, Shandong, and the Ningxia Hui and Inner Mongolian Autonomous Regions. The shelterbelt will extend 3,000 kilometers with a width of 10 kilometers, from Zhongwei County in Ningxia in the west to Binzhou City in Shandong Province in the east.

According to a circular issued by the three departments, the project will be completed in seven years. Preparatory work will be conducted in 1984 and 1985, including surveys, planning, seed collecting, sapling raising and afforestation experiments. Tree planting will be carried out on a large scale in 1986. The circular says that afforestation along the Yellow River will greatly help reduce soil erosion in the Yellow River Valley and accelerate the work of making the country green. It also notes that by organizing young people in the project it will educate them in patriotism and help them carry on the fine traditions of the veteran revolutionaries. The circular urges the provinces and autonomous regions involved to bring the project into line with their development plans for the coming years and with water and soil conservation.

CSO: 4010/82

PLAINS AFFORESTATION SHOWS SIGNS OF SUCCESS

OW081224 Beijing XINHUA in English 1200 GMT 8 May 84

[Text] Beijing, May 8 (XINHUA) -- A mammoth network of shelterbelts is now taking shape in China's plain areas, according to a PEOPLE'S DAILY report today. The network has brought 13.3 million hectares of farmland, nearly half of the farmland on plain areas, under protection from wind and sand storms. In addition, there are nearly 1.9 million hectares of paulownia interplanted with crops, 7.2 billion trees close to houses, on the roadside and along irrigation channels and numerous tracts of forests. Together, they have formed a comprehensive shelterbelt system. Now about 100 counties of the 600 on the plains have completed the planting of shelterbelts.

The network of shelterbelts is reported to have freed crops from sand, drought, hailstorms and other natural disasters and helped improve local climate in cropfields. In addition, they have provided firewood, fodder and manure to local peasants and helped improve the rural environment on the plains which used to have thin green covers. Yanzhou County in Shandong reported that it harvests 75,000 tons of fresh tree leaves of which 10,000 tons can be used as fodder, and 50,000 tons of firewood annually. Afforestation projects on plains started in early post-liberation days under the encouragement of the central government. But the quality of shelterbelts is not satisfactory, the paper says. Measures are needed to protect the trees from diseases and pests, and further efforts should be made in scientific management.

CSO: 4010/82

CENTRAL ORGANS TO AID IN HAINAN AFFORESTATION

HK170350 Haikou Hainan Island Service in Mandarin 0330 GMT 13 Jan 84

[Text] Since 10 January, responsible persons from the Ministry of Forestry, State Planning Commission, the Agricultural Bank of China, and relevant provincial departments and experts and scholars on agriculture and forestry have arrived at the island one after another to discuss the matter related to the planting of 2 million mu of high-yield forests in Hainan District. This is an important measure to exploit the abundant natural resources and speed up the building of Hainan.

As early as 1980, the central leadership raised this tentative idea in circular No 200 and then invested in the planting of some 50,000 mu of high-yield forests in Qionghai, Lingao, Wanning, and Chengmai Counties as a pilot project, and achieved much experience.

Last year, the central leadership, in circular No 11, once again put forth the plan for the Ministry of Forestry to invest in the planting of high-yield forests with Hainan District. The Hainan Forestry Bureau especially invited experts of relevant provincial departments and technological and scientific personnel on the island to collect a vast amount of technological and economic data. If explanations of the feasibility of the project are confirmed, the district will, in the near future, obtain funds from the central leadership to carry out the plan for planting 2 million mu of high-yield forests. This will be the largest investment project by the central leadership in the exploitation and construction of agriculture and forestry in order to speed up the exploitation and building of Hainan, and will greatly promote the restoration of an ecological balance and the development of agricultural economy in the district.

CSO: 4010/82

BUILDING FUEL FORESTS TO SOLVE FUEL SHORTAGES, IMPROVE ECOLOGY

Fuzhou FUJIAN RIBAO in Chinese 15 Sep 83 p 1

[Article by Pan Runrong [3382 3387 2837] of the Fujian Provincial Forestry Design Institute: "Green Energy--Fuel Forests"]

[Text] Pay attention to developing a reproducible green energy resource--fuel forests. They are of very real importance, and are a biological energy resource of high potential.

At present, a large portion of the world's forest resources are consumed for energy in rural areas. According to preliminary statistics from the FAO in 1978, there are now 1.5 billion people in the world who depend mainly on wood burning for energy supplies. Some 1.2 billion cubic meters of wood are used for burning, equal to about one-half of world timber production. Wood supplies about 5 percent of the total world energy resources. China has 170 million peasant families whose rural energy consumption accounts for 40 percent of the total national energy consumption, with an annual need for over 600 million tons of wood and grass for burning. Nationally, some 200 million cubic meters of forest resources are consumed each year, of which 70 million cubic meters are burned in rural areas, equal to one-third of total consumption. Fujian has 4.19 million families in rural areas who burn almost 8 million cubic meters of wood annually, equal to 37 percent of provincial consumption. Of the total number of peasant families among the rural masses, over 40 percent have serious wood shortages, while almost 20 percent have normal shortages. In wood-short coastal communes and brigades, the shortages are even more serious. A few jin of dry wood are equal in value to a jin of rice in the rural markets.

The situation described above shows that there are serious problems in forest energy resources. Foreign countries have taken two main directions for development of forest energy resources. One is to expand forest resources through major afforestation of fuel forests. The other is to reform utilization technologies to increase thermal efficiency. Because China has neglected cultivation of fuel forests for a long time, energy resources in fuel forests are equal to less than 3 percent of the total forest energy resources. The situation in Fujian is much the same. Since fuel forest energy resources cannot satisfy the masses' demands for firewood, some people have cut down and burned a large amount of timber forests.

This has lead to tremendous waste and created serious difficulties for forest protection. The "Resolution on Certain Questions Concerning Forest Protection and Forestry Development" issued by the Party Central Committee and State Council in March 1981 pointed out, "In areas with firewood problems, development of fuel forests should be the primary task of tree planting and afforestation." In order to accelerate the development of forest energy resources in China, some forestry and energy resource specialists not long ago appealed for the state to include fuel forest production in forestry planning. The specialists felt that forest energy resources are easy to grow and convenient to use, and have an important place in rapidly and effectively alleviating the rural energy shortage. At the same time, planting energy resource forests could play an effective role in improving the ecology and environment, water and soil conservation, and increasing forage, fertilizers and materials for sideline processing. The viewpoint which only pays attention to lumber production and ignores the "big log" of fuel forest production does not conform to our national conditions. It will be impossible to safeguard forest resources as a whole if we do not resolve the question of fuel forest production. The construction goals of fuel forests and timber forests are different, and therefore require quite different measures for selection, planting, management, etc. We should select very adaptable, easily germinated, fast growing and easily burnable tree varieties for construction of fuel forests. Based on the concrete conditions of each area of our province, we feel that the best trees for fuel forests are Masson pine, Eucalyptus robusta, Eucalyptus exserta, casuarina, Abrus precatorius, Melia azedarach, oak, and others. "Plant trees and forests to beautify the Divine Land, afforest barren mountains to bring spring across the land." Regions with wood shortages should build more fuel forests in a planned way and make the mountains eternally green to enrich mankind.

12539
CSO: 4008/58

CONSERVATION PROGRESSES IN GANSU

Lanzhou GANSU RIBAO in Chinese 29 May 83 p 1

[Article by Hao Liping [6787 0448 1627]: "Comprehensive Treatment of the Xixiao He Valley Obtains Good Results"]

[Text] After 3 years, 25.6 percent or 80 square kilometers of the Xixiao He valley, a designated key soil and water conservation area, have undergone comprehensive treatment. This spring 12,000 households have signed contracts with the county and the communes for the afforestation of 20,000 mu of barren mountain and the afforestation area in one season was equal to the total afforestation area of the last six seasons in 3 years.

The Xixiao He valley includes three communes in Qingan County and four communes in Gangu County in the central drought area of Gansu and has a total area of 3.2 million square kilometers. This area has very little precipitation, is crisscrossed with gullies and water and soil erosion is severe. After the Xixiao He valley was designated in 1979 as a key area for the comprehensive treatment of water and soil conservation, it received assistance and direction from concerned departments in Qingan and Gangu Counties and the Tienshui water and soil conservancy station of the Huang He committee. The seven communes and 560 production brigades in the area began the comprehensive treatment by cultivating fuel forests to solve the fuel problem. They converted border farmland into forest and grassland, planted trees and grass on barren mountain slopes, organized households to build horizontal terrace field, and constructed reservoirs. By the end of last year they had afforested 32,000 mu with mostly suanci, planted 29,300 mu of purple flower clovers and hibiscus, built a 100,000 cubic meter small reservoir and 57,400 mu of terrace. In 3 years they have cultivated enough forest and grassland to equal the total area reclaimed in the last 30 years. Wangyao Commune in Qingan County has made outstanding achievement of 8.6 mu of afforestation per household or 1.5 mu per person. In the early spring of 1983, Qingan and Gangu Counties further relaxed their policy and contracted 20,000 mu of barren mountain to 12,500 households for afforestation. The regulation allowed barrenland to anyone willing to plant trees and certificates were issued to the households. Contract practice was also applied to the production and sales of seedlings. The incentive for planting trees and grass was greatly increased among the commune members. They relied on their own resources and households, relatives and neighbors helped each

other to solve seedling problems and planted fast growing, drought resistant and hardy trees such as suanci, locust trees, and Chinese toon. Today the task of afforesting 20,000 mu has been completed and the planting of seedling on 600 mu of mountainous area is also near completion. In addition, 1,500 mu of purple flower leguminous grass were planted. Both the quantity and quality of afforestation are better than previous years.

9698
CSO: 4008/191

HARNESSING WASTE MOUNTAINS SCIENTIFICALLY

Beijing RENMIN RIBAO in Chinese 15 Jul 83 p 2

[Editorial: "Protect Vegetation on Waste Mountains, Harness Mountains by Scientific Methods"]

[Text] When waste mountains, slopes and ravines are opened up and harnessed by peasant contractors, the latter become the masters of harnessing mountains and as such have clearly defined responsibilities, rights, and benefits. The peasants' enthusiasm for this is so high that the quantity and quality of every mountain area's vegetation, afforestation, and grass planting this spring have surpassed those of any past year. We should fully value this kind of unusually commendable enthusiasm. If, however, many other things are done likewise, by enthusiasm alone and with no attention paid to science, they will often not be done well and even will be done badly. If they are not done well, this in turn will also dampen the enthusiasm of the masses. In this respect, we have had many lessons.

There are many things that have to be done when scientifically opening up and harnessing waste mountains. The most urgent now are conscientious protection of existing vegetation, uninterrupted increase of new vegetation, and water and soil conservation. Waste mountains with little or no vegetation can neither conserve moisture nor protect the soil and water sources. Such inability is likely to give rise to soil erosion, which impoverishes the soil of mountain areas. Hence, they cannot produce many goods, and the people live in poverty. If wasteland reclamation continues with extensive cultivation, it will bring on more soil erosion and create a vicious cycle. We must change this kind of vicious cycle when opening up waste mountains. In stressing responsibilities, rights and benefits in the area of opening up waste mountains, the first thing to do is to give priority to responsibilities, i.e., to place protection and increase of vegetation of waste mountains and soil and water conservation above everything else. Therefore, signed contracts must be based on actual conditions and must clearly define and stipulate methods of reclaiming and cultivating wasteland, as well as the number of years set for afforestation. Once a contract is signed, the unit offering the contract and the forestry and soil and water conservation departments cannot wash their hands of the matter. Rather, they must make frequent inspections and supervise the contract's execution. If they discover any problem, they must handle it carefully and skillfully.

"Work Regulations on Soil and Water Conservation," issued by the State Council in June 1982, are the standards for the scientific opening up and harnessing of waste mountains. The incidents of disrupting soil and water conservation now occurring in a few localities cannot be separated from the fact that these "Regulations" have yet to be widely publicized. Every level of cadre and every level of scientific and technical personnel in departments of forestry and soil and water conservation must become closely involved in thoroughly explaining and publicizing these "Regulations" to the rural basic-level cadres and to the masses, making them known to every household and every person. The purpose is to heighten the cadres' and masses' understanding of the dangers of soil erosion and of the importance of soil and water conservation and to strengthen their consciousness about these "Regulations" thorough enforcement. At the same time, contractors must be directed in scientific afforestation, grass planting and land use.

Opening up a waste mountain is an arduous task. The growing period of trees is long. A few require 3 to 5 years, but most need several decades before we can benefit from them. We must safeguard the masses' enthusiasm so that they might really benefit from opening up waste mountains. Since the masses often value immediate interests, we must educate them to handle correctly the relationships between immediate and long-term interests and between personal and general interests; in so doing we must speak clearly about gains and losses. Because the masses are reasonable, as long as plans are good and measures appropriate, these problems can be solved. Mountain areas everywhere have their own advantages that must be developed realistically. This way we do not give up the opportunity to reap benefits but also enhance the harnessing of waste mountains and water and soil conservation. For example, during times of benefit from planting varieties of trees and grass, we must combine the long term and short term so that the latter will support the former. We must emphasize the comprehensive development of the forestry, livestock, sideline, processing industries and so forth.

Since the beginning of summer, more than a few mountain areas in north and south China have received fairly abundant rainfall. This year is also the first year in which peasants have contracted to harness large waste mountain areas. Thus, the situation is favorable for opening up waste mountains, but at the same time brings along some problems too. There must be an examination everywhere of the conditions for opening up waste mountains, and there must be a combination of realistically formulated concrete laws and regulations on scientific mountain-management, local regulations and peasants' contracts and so forth. Under no circumstances will we allow harnessing on the one hand, and destroying existing vegetation, on the other. Localities where problems have arisen must adopt measures promptly. As for the extremely few units and individuals that have been educated already but still have not made amends, they must suffer disciplinary intervention or economic sanctions.

12465
CSO: 4008/187

BRIEFS

NEI MONGGOL AFFORESTATION--As of 30 April, Nei Monggol region afforested some 2.94 million mu, an increase of 25 percent over the corresponding 1983 period and fulfilling the annual plan by 58.8 percent. [Summary] [SK110655 Hohhot Nei Monggol Regional Service in Mandarin 1100 GMT 8 May 84 SK]

HEILONGJIANG AFFORESTATION WORK--Heilongjiang Province has overfulfilled the annual afforestation plan by 3 months. As of 10 May, the province afforested 5.2 million mu, overfulfilling the annual plan by 17 percent and a 30 percent increase over the corresponding 1983 period. [Summary] [Harbin Heilongjiang Provincial Service in Mandarin 1000 GMT 10 May 84 SK]

GANSU GRASSLAND ECOLOGY MEETING--The first grassland ecology seminar to be convened by the Chinese Grassland Association was held in Lanzhou from 23 to 27 March. The participating 64 grassland and animal husbandry experts from all parts of the country exchanged experiences on topics such as developing animal husbandry by planting trees and grass, popularizing dryland cultivation technology, carrying out comprehensive harnessing of mountains, rivers, forests, and grasslands, clothing the mountains in green, and promoting grassland construction. They also discussed the question of planting grass and trees in Gansu, and put forward suggestions. A total of 68 theses were exchanged. Provincial CPC Committee Secretary Li Ziqi, Governor Chen Guangyi, and Vice Governor Hou Zongbin spoke at the meeting. [Text] [HK290623 Lanzhou Gansu Provincial Service in Mandarin 1100 GMT 28 Mar 84]

JILIN SHELTERBELT PROJECT--Jilin Province has scored marked achievements in the first stage of the project for North, Northeast, and Northwest China shelterbelts. The first stage of the project began in 1978. As of the end of 1983, the province afforested 8.24 million mu. Some 6.02 million mu have survived. [Summary] [Chang Jilin Provincial Service in Mandarin 1030 GMT 30 Mar 84 SK]

CSO: 4008/298

PROGRESS ON NATIONAL LAND RESOURCE SURVEY REPORTED

Beijing RENMIN RIBAO in Chinese 16 Dec 83 p 2

[Text] Correspondents Wu Xiulong [0702 4423 7893] and Liu Yunzhou [0491 0336 3166]: our national land resources survey has been deployed on a large scale and has achieved remarkable results. It has laid the groundwork for the scientific development and utilization of land.

This land resource survey, which has been going on for 5 years, includes the survey of current land use and the 2nd national soil survey. This is the largest survey of this range and scale since the founding of the PRC. More than 200,000 people are directly involved in the survey work. At present, 1,982 counties (banners) are carrying out survey work, accounting for 83 percent of the total number of counties (banners) in the nation and 996 counties have completed the work; 1,180 counties are conducting general surveys on current land use, accounting for 49 percent of the total number of counties and 474 counties have completed the survey. In addition, 11 provinces, cities and autonomous regions, on the basis of land resource survey, have undertaken land evaluation experiments with different methods, and have gained some preliminary experience.

This survey has obtained a large quantity of scientific data and has determined the condition of land resources in part of the country. It also gives new understanding to the quantity, quality and utilization level, etc., of land resources, thereby providing a scientific basis and material to formulate agricultural divisions, long-term planning and to readjust the agricultural structure and distribution.

At present, there are more than 1,000 counties undertaking meticulous agricultural division by using the material of the soil survey and current land use surveys. With the help of the survey results, many counties are readjusting the agricultural structure and distribution and have obtained noticeable economic results. Hilly and mountainous areas in Shandong Province after completing the survey and readjustment have increased production by more than 40 percent, and some areas have even doubled their production.

12369
CSO: 4008/104

GUANGMING RIBAO ON CHANG JIANG VALLEY DEVELOPMENT

HK100719 Beijing GUANGMING RIBAO in Chinese 29 Mar 84 p 2

["Work Research" column by Zhang Siping. "Several Questions Concerning the Exploitation and Development of the Chang Jiang Valley" -- capitalized passages published in boldface]

[Text] The Chang Jiang Valley stretches over 18 provinces, municipalities, and regions. The total population of the valley is 355 million people, and the valley consists of a total areas of more than 370 million mu of arable land.

This area has warm weather, plenty of rainfall, rich soil, easily accessible communications facilities, abundant resources, and relatively developed industrial and agricultural production. According to our statistics, this area turned out 36.7 percent of the nation's grain and about 40 percent of the nation's gross industrial output value in 1980. Therefore, the exploitation and development of the Chang Jiang Valley is of extremely great importance for our country's national economy.

However, for a long time we have failed to give satisfactory play to the economic ascendancy and potential of the Chang Jiang Valley. Its water transport volume is only one-ninth of the volume of the Mississippi and is far below that of the Volga, the Seine, and the Danube. Less than 3 percent of the Chang Jiang's water resources are exploited. This percentage is not only far below that of the Huang He, but is also lower than the national average exploitation rate of 3.4 percent. Because the peak flood season, the capability to resist flooding is generally low in this area. At the middle and lower reaches of the river, particularly in the Jing Jiang area, we have still failed to radically change our passive position in preventing floods or to put an end to the dangerous situation in the flood season. Therefore, flooding continues to directly threaten the lives and property of our people. In this area there is still 150 million mu of farm land with poor irrigation facilities or not irrigated at all. At the upper reaches of the river, irrigated land accounts for one-fourth of the farmland. In 1978, 61 million mu of land in the middle and lower reaches of the river suffered serious drought. There are now 100 million mu of water throughout this area. According to our incomplete statistics, during the past 20 years the water area has continuously decreased. The lake area has decreased by 16 million mu and the fish catch has declined. Vegetation on many mountainous and hilly areas have been seriously destroyed and there is soil erosion in 360,000 square kilometers of land. The water in the Chang Jiang is seriously polluted. At present, 26 million metric tons of polluted water flows every day into the Chang Jiang System. This means every year nearly 10 billion metric tons of polluted water flows into it. In some areas all the fish and shrimp have perished. This seriously harms the people's health and hinders industrial

and agricultural production. Therefore, vigorously exploiting and developing the Chang Jiang Valley to promote what is beneficial and remove what is harmful, and thus benefit the people, will increase the state's economic strength and bring along and promote the development of other areas in our country.

How are we to exploit and develop the Chang Jiang Valley? I will give a few of my opinions:

1. WE SHOULD ESTABLISH FACTORIES ALONG THE RIVER AND DEVELOP A CHANG JIANG INDUSTRIAL CORRIDOR.

There are many problems that we should solve in exploiting and developing the Chang Jiang Valley. From the point of view of the whole situation of the exploitation of and development in this area, establishing factories along the river so as to gradually set up a Chang Jiang industrial corridor is a key link to bringing along the exploitation and development of the Chang Jiang Valley. It can promote the exploitation of the resources in the Chang Jiang and the shipping on the river. It will also facilitate the exploitation of the abundant and cheap hydroelectric power and give play to the favorable economic conditions there. As a result, it will bring about the all-round development of the entire economy in the Chang Jiang Valley.

Cheap and convenient shipping service and abundant water resources are important conditions for the development of modern industry. Therefore, it is a general law in the development of the economy of foreign countries to locate their industries along rivers. All the countries in the world that use rivers pay great attention to setting up their industries along rivers.

For example, in the United States, 93 percent of its metallurgical factories and newly built coking plants are located along its rivers, as are its nuclear energy and missile factories. From 1952 to the end of 1976, the number of factories that were built or extended along its rivers exceeded 10,000.

There are many advantages in establishing factories along rivers. When the factories are being built, less farm land will be occupied and a smaller number of people will need to be relocated. The factory can spend less for its inland transport facilities and can easily transport large equipment from outside. It can also utilize the building materials on the near river banks. When the factories are set up, they can receive a convenient water supply from the rivers for industrial use and can receive a cheap supply of hydroelectric power, raw materials, and fuel from nearby. They can also greatly reduce the transport cost of their final products. Compared with other rivers, the Chang Jiang Valley has more favorable conditions for establishing industries along it. In this area there is a sufficient supply of raw materials, convenient transport facilities, a satisfactory water supply for industrial purposes, and abundant and cheap hydroelectric power is available. Moreover, the Chang Jiang Valley, particularly the middle and lower reaches, is densely populated and has a sound industrial and agricultural foundation. Therefore, enterprises established along the river will have a vast market for their products, acquire relatively advanced technology, and have a sufficient supply of labor. They will also find it easier to develop external economic and technological exchanges.

2. WE SHOULD SATISFACTORILY SHIFT THE STRATEGIC KEY TO THE DEVELOPMENT OF HYDROELECTRIC POWER PRODUCTION ON THE CHANG JIANG AND STRIVE TO ACHIEVE THE GOAL OF "TRANSMITTING ELECTRICITY FROM WEST TO EAST" AS SOON AS POSSIBLE.

The Chang Jiang Valley is relatively lacking in mineral energy resources. This constitutes a major restriction that hinders the development of industry, particularly heavy industry, in the Chang Jiang Valley. For a long time in the past, the main method to satisfy the demand for energy in the middle and lower reaches of the Chang Jiang was to transport coal from the north to these areas. This put great pressure on our transport sector. As the economy develops, the contradiction between the supply and demand of energy in the middle and lower reaches of the Chang Jiang becomes increasingly serious. In order to solve this problem we must simultaneously carry out the policies of "transporting coal from the north" and "transmitting electricity from the west." While maintaining a necessary volume of coal transport from north to south, we should adopt firm and effective measures to exploit the abundant water power resources in this valley and give priority to this task. Because of the restriction of various kinds of conditions, in developing the hydroelectric power industry in the past we mainly exploited the waterpower resources in the middle and lower reaches and built relatively more medium and small hydroelectric power stations, However, these methods now are not enough to satisfy our needs, for after many years of construction, there have already been few "rich mines" of hydropower resources left in the middle and lower reaches of the Chang Jiang. In addition, as modern industry develops, it demands a long-term, stable, and safe supply of a large amount of electricity and have relatively poor capability to adjust the power supply. Therefore, they can only adapt to the demand for electricity by local industries and rural commune and brigade enterprises, but they cannot satisfy the demand resulting from the development of modern industry. Therefore, the strategic key to the development of the hydroelectric power industry on the Chang Jiang must be shifted from focusing on the development in the eastern areas onto focusing on the development in the western areas. We should build powerful hydroelectric power bases in the western areas, transmit electricity there, a long distance away, and use the powerful supply of electricity to enable the economy in the Chang Jiang Valley to develop into an integrated system.

The establishment of huge water conservation projects in the three gorges must become the strategic starting point in the shifting of our focus of work. These projects should be regarded as the relay link in "transmitting electricity from west to east." The three gorges are situated in the upper and middle reaches of the Chang Jiang and are considered to junction for "transmitting electricity from west to east." They have abundant hydroelectric power resources, are suitably situated, and are characterized by advantageous indexes for development. Therefore, the projects there will be the principle projects in exploiting the water power resources in the Chang Jiang. The design scheme for the key projects on the three gorges is as follows: Low dams of 150 meters for normal water levels will be established for the installation of 13 million kilowatt generators. The annual output of electricity will be 65 billion kilowatt-hours and the investment will only be 870 yuan per kilowatt, much lower than for the hydroelectric power stations that we are building or plan to build in the middle and lower reaches of the Chang Jiang. The three gorges projects are appropriately situated in the middle of our country and thus have favorable conditions for transmitting electricity. All the major cities in the middle and lower reaches are with the radius of their power transmission.

3. WE SHOULD ESTABLISH A WATER CONSERVATION SYSTEM TO PREVENT FLOODING ON THE CHANG JIANG, AND VIGOROUSLY PLANT GRASS AND TREES, THUS GUARANTEEING THE FOUR MODERNIZATIONS AND THE SAFETY OF OUR PEOPLE.

According to the experiences gained over many previous years, the strategic principle for harvesting the river and preventing floods is to pay attention to both "storing" and "discharging" water while regarding "discharging" as the key to establish and continuously perfect a water conservation system in order to prevent flooding of the Chang Jiang and this achieve the goal of finally eliminating floods once and for all in the middle and lower reaches of the Chang Jiang. This system will consist of the following four parts:

1. We should increase the strength and height of our river dikes, dredge the river bed, readjust the river flow, and thus utilize the role of the dikes in preventing floods.

2. We should develop and gradually perfect storage projects to reduce by the greatest possible extent the losses caused by flooding.

3. We should combine the work of preventing floods with the work of promoting beneficial work. We should build reservoirs at the upper reaches of the trunk and tributary rivers in order to store flood water and prevent floods.

4. From a long-term point of view, vigorously planting grass and trees on the mountainous and hilly areas at the upper and middle reaches of the Chang Jiang to preserve water and soil and safeguard the ecological balance is also a major measure to prevent the disaster of floods and to achieve comprehensive results.

4. WE SHOULD DEVELOP THE SHIPPING INDUSTRY ON THE CHANG JIANG AND SPEED UP THE DEVELOPMENT OF AN INLAND WATER TRANSPORT NETWORK THERE.

Revitalizing the shipping industry on the Chang Jiang and speeding up the development of an inland water transport network there is an outstanding issue in revitalizing the economy in the Chang Jiang Valley. For this we should adopt the following measures:

1. We should increase our investment and speed up the capital construction in the shipping industry on the Chang Jiang. The Chang Jiang, particularly its middle and lower sections, which are part of the deep and broad trunk river, has great economic advantages in developing the capital construction of the shipping industry.

For example, the investment in dredging the river for transport is only one-fifth of that for building a road of the same length, and is even lower than that for building a railway, but the transport capacity is much larger than a road or a railway. However, for many years in the past, we have failed to formulate a long-term plan or to make much investment for the development of the shipping industry on the Chang Jiang and its tributaries. Since the founding of the PRC, the state investment in Chang Jiang river's shipping industry has totaled 3.05 billion yuan, which is only one-fourth of the investment in the Xiangyang-Chongqing railway.

2. We should strengthen the management, raise the technological standard of the equipment, and lower the shipping transport cost. At present, the freight charge on the

upper reaches, particularly on its main tributaries, and the freight charges for the entire length of the river are both higher than the freight charges on our railways. This has made people prefer land transport to water transport. The reason for this is the poor management, the backward equipment, the poor efficiency of our ships, and the decentralization of the management system. Therefore, regarding our shipping sector, in developing the Chang Jiang water transport network it is urgently necessary to regard the raising of our economic results as the core, strengthen the management in our shipping enterprises, reform the irrational management systems, renew the outdated and backward ships and machinery, and thus greatly lower the shipping cost.

3. In developing water conservation facilities on the Chang Jiang we should place shipping transport in an important position. In building key water conservation projects on a navigable river, we must take into consideration the improvement of shipping conditions and carrying out, in order of urgency and in a planned and systematic manner, the projects for the restoration of shipping transport in the river sections where dams block shipping transport.

5. WE SHOULD STRENGTHEN ECONOMIC RELATIONS AND TECHNOLOGICAL COOPERATION AND PROMOTE THE ECONOMY IN ALL AREAS OF THE CHANG JIANG VALLEY TO DEVELOP TOGETHER.

There are abundant resources at the Chang Jiang Valley, but their layout is uneven. Most of the resources lie at the upper and middle reaches, particularly the upper reaches, but because of the restriction of the technological, financial, and economic conditions there, it is difficult to exploit and utilize these resources. However, the middle and lower reaches, particularly the lower reaches, are relatively economically developed and have a relatively high technological level, but the shortage of resources there hinders the further development of its economy. Through strengthening the economic relations and developing economic and technological cooperation within the valley, and thus transferring technology from east to west and raw materials and energy from west to east, we will be able to combine resources with funds and technology and thus promote the common economic prosperity in this valley.

CSO: 4008/273

LAND USE PROGRAMS ADVOCATED AS PREREQUISITE TO FEASIBILITY STUDIES

Taiyuan JISHU JINGJI YU GUANLI YANJIU [RESEARCH ON THE ECONOMICS AND MANAGEMENT OF TECHNOLOGY] in Chinese No 2, 1983 pp 19-20

[Article by Ren Boping [0088 0130 1627]: "Basing Project Feasibility Studies on Land Use Programs"]

[Text] Experts have submitted many useful opinions on the Shanxi Coal and Energy Base program, expressing a variety of viewpoints. The present article presents a few personal views on the subject.

In recent years, as a result of emphasis on economic results, many comrades have focused their attention on technical and economic analysis of development programs, and some have even carried out feasibility studies and system analysis. These approaches are entirely necessary, of course, but the belief that calculation of a variety of economic indicators such as the investment pay back period, internal earnings and the like will allow selection of the optimal program, or that the adoption of a program should depend solely on a group of economic indicators, seems to me disputable.

I believe that the technical and economic analysis of any development program, including feasibility studies and systems analysis, must be based on a land program and a regional development program, i.e., it must be based on an analysis of land economics. Any development program must provide for comprehensive utilization of resources and comprehensive land management if it is to be an optimal program.

Analyzing experience in China and abroad, and inside and outside this province, will make it clear that large-scale development projects carried out by any country or area in terms of a single department or a single resource have been unsuccessful. In area development, many countries have neglected coordinated economic development and overall land management, and while in the short term individual industrial departments have appeared to develop rapidly, in time problems have come to outweigh benefits and the costs to exceed the gains, and even the industrial branches that were to benefit have suffered considerable losses. The Appalachia coal region of the United States is an example.

Appalachia is the largest coal base in the United States, and in the world. Its development zigzagged from prosperity to decline to prosperity, and some of the experiences involved are well worth our consideration.

The total area of Appalachia is 3 times that of Shanxi, while its population is only three-fourths as great, so that the population density is less than a quarter that of Shanxi: thus it is an extensive, sparsely populated area. In addition it has extensive forest resources and copious rainfall, making for favorable natural conditions.

English colonists discovered coal there in 1699 and began extracting it in 1750. But it was only in the 1880's, with the vigorous development of the iron and steel industry, that coal output began to climb rapidly. In 1947, stimulated by the defense industry, output reached its peak of 570 million tons. Thereafter it dropped rapidly, falling to 270 million tons in 1960, while coal mine employment dropped abruptly from 340,000 to 140,000, creating serious social problems.

There were also serious natural, geographic and scenic problems. Because coal fields had long been indiscriminately extracted and the forests wantonly cut down, major damage had been done to the environment. Opencut mining alone had destroyed 4.5 million mu of land, equivalent to about one-third of the arable land in Shanxi. Some 3 billion tons of waste rock caused the acid oil pollution of 17,000 kilometers of rivers and streams; some streams were blocked up, and soil erosion became more serious.

Starting in the 1960's, the U.S. Congress passed the Appalachia Development Program in order to ease the crisis, committing the Federal Government to provide funds for improvement of the economic and social structure. Since 1965, the area, which formerly was solely a coal producing area, has been converted into an area which, while centered on coal, is also a powerful combined electric power and iron and steel base; communications, transport and material conditions have also been improved. By 1975, raw coal output had climbed back up to 421 million tons, or 62 percent of the national total, steel output had reached 63 million tons, 60 percent of the national total, and electric power output had reached 480 billion kWh, or 61 percent of the national total.

Through adjustment of several investment policies, the area's unemployment rate has been decreased, although it is still above the national average. Output of raw coal has increased, although it is still far below its past high; in 1978 it again fell to 370 million tons. Thus it is obvious that although some of the area's problems have been overcome, they have not been fundamentally solved.

The rise and fall of Appalachia reflects the social, economic and environmental problems brought on by capitalist industrialization, which are necessary consequences of monopoly capital's pursuit of maximum profits and of uncritical unplanned development. China, a socialist country, can use the objective law of planned, proportional development of the national economy, so that we are capable of avoiding the situation that developed in Appalachia. But as Comrade Stalin pointed out, "The law of planned development of the national economy gives our planning bodies the potential to plan production correctly, but we should not confuse potential with actuality." If our planning work does not correctly reflect objective reality, we will not be able to correctly follow and utilize objective law, and the result may be serious loss to the national economy.

A matter for particular vigilance is the fact that Shanxi's natural conditions are inferior to those of Appalachia, and damage to the ecology and the environment would cause much greater loss to the national economy. Shanxi is in the eastern part of the world's largest loess plateau and has a semiarid climate with a rainfall only a quarter that of Appalachia. It has only slightly more than 10 percent forest cover, and the per-capita forested area is only 1 mu, less than one-twentieth that in the United States. Because of damage to natural vegetation, soil erosion is now extremely serious. An average of 456 million tons of flatland soil is lost outside the province every year, equivalent to removal of a soil layer 4.4mm thick over the entire province every year (including uncultivated mountains and slopes). In 1967 the figure reached 1.2 billion tons, equivalent to removal of a 12-mm soil layer.

With these rather poor natural conditions, the development of large-scale agriculture has proceeded slowly, and agriculture in the narrow sense, particularly the extreme form of grain-oriented cultivation, has predominated. The province's average per-mu grain yield is only a little over 300 jin, and the per-capita grain output is approximately 630 jin, both below the national average.

Not only agriculture, but the entire national economy of the province is in this situation. Although in the last 30 years heavy industry (particularly the coal industry) has developed rather rapidly in Shanxi and has vastly improved the people's standard of living compared with pre-Liberation times, between 1952 and 1978 the gap between the province's standard of living and the national average actually increased. At the same time, Shanxi's coal output increased by 40 times and the amount sent out of province increased by 90 times; it can well be imagined that if the tendency for the energy industry to lose touch with overall land management is not reversed, even if the coal industry's output increases by a factor of 2 or 3 compared with the present level, this will not guarantee a relative improvement in the people's standard of living. If things are not handled properly, the gap between Shanxi and the national standard will widen further, with the result that it will not be possible to fully motivate the people to build the energy base and the pace of its construction will not be very rapid.

Thus I believe that while various advanced methods should be utilized in the planning process, it is more important to work out, well in advance, an overall program for the regional disposition of economic construction, i.e., a land program, in order to avoid the one-sidedness, narrow viewpoint or error of feasibility studies or system analysis focusing on a single city or a single department.

In general, regional land programs should include at least the following major components: 1) a regional industrial plan, focused on mining and manufacturing industries; 2) a regional city and town concentration plan, focused on cities; 3) a regional agricultural plan, focused on cultivation, forestry and livestock-raising, but also including sideline industries and fisheries; 4) a river basin plan, focused on comprehensive development and management of rivers; 5) a rather large-scale scenic and tourist area and nature protection plan; 6) provincial and prefectural city-level integrated industrial and agricultural development

district plans. Use of these specialized plans to coordinate the various mutually constraining natural, social and economic factors, to plan the overall development of the various natural, technical and manpower resources, and to thoroughly satisfy the people's steadily growing material and cultural needs constitutes the method and objective of land programs.

8480
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TAI HU BASIN SURVEY, CONTROL PLAN DISCUSSED

Beijing RENMIN RIBAO in Chinese 19 Nov 83 p 2

[Article by Yang Ying [2799 3841] and Ji Jincheng [1323 6651 2052]: "Relevant Departments of Jiangsu, Zhejiang, Anhui, Shanghai and the State Council Form a Survey Team To Conduct a Comprehensive Survey of the Tai Hu Basin and Study a Management Program"]

[Text] Shanghai, 17 Sep (XINHUA)--The Tai Hu basin general survey team--comprised of leading cadres, experts and engineers from the relevant departments of Jiangsu, Zhejiang, Anhui, Shanghai and the State Council--completed its general investigation, studied a comprehensive management program and thus provided an excellent beginning to coordinated and scientific water control.

Between 20 October and 12 November, the team obtained much first-hand data through on-the-spot surveys of the mountains in the upper reaches of the Tai Hu basin, major rivers and lakes, the facilities of nearly 30 irrigation systems and some disputed sectors in the basin.

The Tai Hu basin, the cream of the Shanghai economic area, has been acclaimed China's "golden delta." With an area of more than 36,000 square kilometers, a population of over 30 million and 25 million mu of arable land, the basin is renown as the "land of plenty" and the "home of silk," has produced a total of over 25 billion jin of grain and provides several billion jin of commercial grain to the state annually. Agriculture, forestry, animal husbandry, sideline industry, fishery, industry, commerce, communications, culture, education, science and technology are all more advanced here. The basin's industrial and agricultural production value accounts for approximately one-seventh of the national total, and the area provides about one-fifth of the state's total revenues. Thus the basin occupies a decisive position in the development of China's economy.

With the solicitude and support of the party and government since Liberation, the broad masses of cadres and people in the Tai Hu basin engaged in arduous struggle to achieve enormous successes in water conservancy construction, to change production conditions and to stimulate the development of agriculture, industry and sideline production. Yet, because the basin overlaps two provinces and one municipality, the guiding managerial policies among the various areas have been uncoordinated, unanimous agreement has never been achieved in over 20 years of discussions concerning control programs for the basin and each area has gone its

own way. Some low-lying areas have constructed dikes of various sizes without providing outlets for backed-up water. Electric pumping capacity has expanded tremendously in diked areas, resulting in rises in the water levels of outer rivers. Especially serious is that some areas have blindly created much dike-enclosed reclaimed land, thereby reducing the basin's water adjustment and storage capacity. Consequently, Tai Hu and the surrounding rivers and lakes frequently have experienced persistent high water levels, which increase the threat of flooding.

The survey greatly heightened the sense of urgency regarding the need to control Tai Hu. Everyone realized that we must surmount the confines of administrative boundaries, focus on and emphasize the basin as a whole, support each other and dedicate ourselves to achieving unity in water control. Some comrades declared on the spot that diked rivers ought to be reopened. Others called for investigation of each dike-reclaimed area and urged that control be handled in accordance with varying conditions. Everyone conscientiously discussed the Tai Hu control program submitted by the Chang Jiang Valley Planning Office and studied the problems of the comprehensive utilization and management of shipping, aquatic production and water resources in the Tai Hu basin.

Responsible members of the governments of Shanghai, Jiangsu, Zhejiang and Anhui all attach great importance to this survey. After hearing reports on the basin management program, they unanimously asserted that, since the basin is an integral whole, the general picture must be emphasized, management must be comprehensive and the fraternal provinces and municipality must support each other and cooperate before the greatest economic results can be achieved at the least cost and so as to enable the basin to make even greater contributions to China's "four modernizations."

12431
CSO: 4008/77

'TEXT' OF PRC WATER POLLUTION CONTROL LAW

HK300952 Beijing RENMIN RIBAO in Chinese 13 May 84 p 2

["Text of PRC Water Pollution Prevention and Treatment Law--adopted by the Fifth Session of the Sixth NPC Standing Committee on 11 May 1984"]

[Text] Chapter One: General Principles

Article 1: In order to prevent and control water pollution and protect and improve our environment so as to guarantee the physical health of our people, ensure the effective exploitation of our water resources and promote the development of our socialist modernizations, this law has been specially formulated.

Article 2: This law is only applicable to the prevention and control of pollution in the rivers, lakes, canals, water channels, reservoirs, and other bodies of water on and under the ground within the territory of the PRC.

The prevention and control of pollution of sea areas is governed by a separate law.

Article 3: The relevant departments of the State Council and the local people's governments at various levels must include work related to the protection of the environment in our water areas in their plans and adopt relevant policies and measures to prevent and control water pollution.

Article 4: The environmental protection departments in our people's governments at various levels are the organs that are in charge of exercising unified supervision and administration over the prevention and control of water pollution.

The shipping administrative organs in the communications departments at various levels are the organs that are in charge of exercising supervision and administration over the prevention of pollution caused by ships.

The water conservation administrative departments, public health administrative departments, geological and mining departments, city administrative departments, and the water sources protection organizations on various important rivers should coordinate, in light of their own responsibility, with the

environment protection departments in supervising and administering the work related to prevention and control of water pollution.

Article 5: All units and individuals have the duty to protect the water environment and are empowered to supervise and inform against any acts that pollute or undermine the water environment.

The units and individuals who have directly suffered losses caused by water pollution are entitled to demand that those who caused this pollution eliminate it and pay damages for their losses.

Chapter Two: Formulation of the Standards for the Quality of the Water Environment and for the Release of Pollution

Article 6: The environmental protection department of the State Council is responsible for fixing the national standards for the quality of the water environment.

The provincial, regional, and municipal people's governments can stipulate local supplementary standards for what the national water environment quality standards do not cover and report these supplementary standards to the State Council's environmental protection department for the record.

Article 7: The environmental protection department of the State Council stipulates the national standards for the release of pollutants in light of the national standards for the quality of the water environment and the state's economic and technological conditions.

Provincial, regional and municipal people's governments can fix local standards for the release of pollutants that are more stringent than the national standards for the release of pollutants for the bodies of water where the implementation of the national standards for the release of pollutants cannot ensure that the water environment there will satisfy the standards for water environment quality. They should report these local standards to the environmental protection department of the State Council for the record.

Wherever a local standard for the release of pollutants has been fixed for the release of pollutants in a body of water, this local standard for the release of pollutants should be enforced.

Article 8: The State Council's environmental protection department and the provincial, regional, and municipal people's governments should revise, at an appropriate time, the standards for the quality of the water environment and the standards for the release of pollutants in accordance with the requirements for preventing and controlling water pollution and in light of the economic and technological conditions of the nation.

[HK301010] Chapter Three: Supervision and Administration Related to Prevention and Control of Water Pollution

Article 9: In exploiting, utilizing, readjusting, and allocating water resources, the relevant departments of the State Council and the people's

governments at various levels should take all factors into consideration, maintain the rational discharge of our rivers, the rational water level of our lakes, reservoirs, and underground bodies of water, and the natural purification capacity of our bodies of water.

Article 10: The relevant departments of the State Council and the local people's governments at various levels must include the protection of urban water sources and the prevention of urban water pollution in urban construction plans, build and upgrade drainage systems and sewage treatment facilities.

Article 11: The relevant departments of the State Council and the local people's governments at various levels should rationally plan the layout of our industry, carry out consolidation and technical transformation in the enterprises that cause water pollution, adopt comprehensive measures to prevent and control water pollution, raise the reutilization ratio of our water, rationally utilize our natural resources, and reduce the discharge of waste water and pollutants.

Article 12: The people's governments above county level can designate as protected areas sources of drinking water for the people's livelihood, bodies of waters in well-known scenic spots, bodies of waters important for fishery, and other bodies of waters of special economic or cultural value and adopt measures to ensure that the quality of water in the protected areas satisfies the water quality standards formulated for their particular purposes.

[HK301130] Article 13: Construction projects to be newly built, expanded or under transformation, or other equipment to be installed over water surfaces, which will directly or indirectly release pollutants into bodies of water must observe the state's stipulations on the environmental protection administration.

In writing a report on the environmental effects of a construction project, it is imperative to make an appraisal of possible water pollution by the project under construction, and its effects on the ecology, while formulating preventive measures. The report should be submitted to relevant environmental protection departments for their examination and approval in accordance with the process stipulated. The installation of waste water outlets in water conservancy work, such as canals, channels, and reservoirs should first meet the approval of the relevant administration departments of the water conservancy project concerned.

Before the construction project is put into production or use, its water pollution prevention equipment must be tested by the environmental protection department. If it should fail to meet the requirements, it is forbidden to put the construction project concerned into production or use.

Article 14: Those enterprises or units of undertakings which directly or indirectly release pollutants into bodies of water should act in accordance with the stipulations of the environmental protection department under the State Council and report to the local environmental department and register the equipment for releasing pollutants in their possession, the measures for

handling them, and the categories, quantity, and density of pollutants released under ordinary operations, and provide the local environmental protection department with the relevant technical materials on the prevention and treatment of water pollution.

Important changes in the categories, quantity, and density of pollutants released should be promptly reported. The removal or lying idle of equipment for treating pollutants should be reported beforehand, for the approval of local environmental protection departments.

Article 15: Those enterprises or units of undertakings which release pollutants into bodies of water should pay fees for releasing pollutants according to the stipulations of the state; in cases where the pollutants released exceed state or local stipulations, those enterprises or units of undertakings should pay additional fees for exceeding the standards of pollutants released and should be responsible for their treatment.

Article 16: Those units releasing pollutants which have caused grave pollution in bodies of water should treat the pollution within a time limit.

The time limit set for enterprises or units of undertakings under the direct jurisdiction of the central government, or provincial, autonomous, regional, or municipal governments for treating pollution will be suggested by the environmental protection departments of the provincial, autonomous regional, or municipal governments, and be submitted to the people's government at the same level for its decision. The time limit set for enterprises or units of undertakings under the jurisdiction of governments at or below city or county levels will be suggested by environmental protection departments under the governments at city or county levels, and will be submitted to the people's government at the same level for its decision. The unit treating the pollution should fulfill the task within the stipulated time period.

Article 17: In an emergency like the serious pollution of the source of drinking water or the threat to the safety of the water supply, and so on, the environmental protection department should report to the people's government and seek its sanction for adopting emergency measures, which include ordering the enterprise or unit of undertaking concerned to stop releasing pollutants.

Article 18: The environmental protection departments under the people's governments at all levels, and relevant supervision and administration departments are authorized to conduct on-the-spot examination of units releasing pollutants within the range of their jurisdiction, the units undergoing examination must truthfully reflect the actual condition and provide the necessary materials. The organs conducting the examinations are responsible for keeping the technological and professional secrets of the units under examination.

Chapter Four: Prevention of Water Pollution on the Earth's Surface

Article 19: It is forbidden to build new outlets for waste water in sources of drinking water, bodies of water in scenic areas, bodies of water important for fisheries, and bodies of water of particular economic or cultural value in protected areas. Outlets for waste water to be built in the neighborhood of protected areas must ensure that the bodies of water in the protected areas are not polluted.

Regarding those outlets for waste water existing before the publication of this law, when the pollutants released exceed state or local standards, they should be under treatment; and if those waste water outlets should damage sources of drinking water, they should be moved away.

Article 20: If an accident or some unexpected incident takes place in the unit releasing pollutants, with the pollutants released exceeding the normal amount of release, which causes or will possibly cause the accidental pollution of water, emergency measures must be adopted at once. A circular should be tendered to the units which will possibly be injured or damaged by the polluted water, and the case should be reported to the local environmental protection department. In the case of accidental pollution caused by ships, a report should be made to the nearest navigation administration organs for their investigation and handling.

Article 21: It is forbidden to release into bodies of water acid liquids, alkaline liquids or waste liquids containing toxic matter.

Article 22: It is forbidden to clean vehicles and containers in which oil or toxic pollutants have been stored in bodies of water.

[HK301152] Article 23: The discharge or pouring into bodies of water or directly burying in the earth of soluble toxic dross containing mercury, cadmium, arsenic, chromium, lead, cyanide, yellow phosphorus, and others, is prohibited.

In places where soluble toxic wastes are stored, measures should be adopted to prevent leaking, percolation, and erosion.

Article 24: The discharge or pouring into bodies of water of industrial wastes, city garbage, or other wastes is prohibited.

Article 25: The piling up and storing of solid wastes and other pollutants at beaches or on slopes located at the lower reaches of rivers, lakes, canals, irrigation ditches, and reservoirs is prohibited.

Article 26: The discharge or pouring into bodies of water of radioactive solid wastes or waste water containing high radioactive or medium radioactive matter is prohibited.

State regulations and requirements concerning radiation prevention should be followed when discharging waste water into bodies of water.

Article 27: When discharging hot waste water into bodies of water it is necessary to adopt measures to ensure that the temperature of the bodies of water conforms to the regulations governing water environmental protection to prevent thermal pollution.

Article 28: Sterilization treatments in accordance with state regulations, is needed when discharging waste water containing causative agents. Otherwise discharging such waste water is prohibited.

Article 29: When discharging industrial waste water and city waste water into farmland irrigation ditches, it should be ensured that water quality of the irrigation areas located at the nearest lower reaches conform with the standards governing the water quality for irrigating farmland.

When making use of industrial waste water and city waste water to irrigate farmland, it is necessary to prevent the pollution of soil, ground water and agricultural products.

Article 30: The application of agricultural chemicals should be in accord with state stipulations and requirements concerning safe application of agricultural chemicals.

More efforts should be made to strengthen management of transport and storage of agricultural chemicals and the disposal of expired and ineffective agricultural chemicals in order to prevent water pollution.

Article 31: When boats and ships discharge waste water containing oil and domestic sewage, they should abide by the regulations concerning the discharge of pollutants from boats and ships. When oceangoing ships enter inland rivers or ports, they should abide by the regulations governing the disposal of pollutants in inland rivers.

Residual oil and waste oil should be recovered, and pouring them into bodies of water from ships and boats is prohibited.

Pouring garbage into bodies of water from boats and ships is prohibited.

When boats and ships load and transport oily goods and toxic goods, it is necessary to adopt measures to prevent them from leaking and percolating in order to avoid water pollution because of the drenching or leakage of these goods.

Chapter Five: Prevention of Ground Water Pollution

Article 32: Enterprises and establishments are prohibited from making use of negative wells, sinks, cracks, or holes to discharge or pour into bodies of water waste water containing toxic pollutants, sewage containing causative agents, or other wastes.

Article 33: When there are no good-quality water-resisting layers, enterprises and establishments are not allowed to make use of ditches, hole pits,

or dykes to carry or store waste water containing toxic pollutants, sewage containing causative agents, or other wastes.

Article 34: When exploiting multilayer ground water, exploitation should be carried out layer after layer, provided thatthe quality of water at various layers is greatly different. While exploiting the water, phreatic water which has been polluted should not be mixed with confined water.

Article 35: When carrying out underground projects, underground prospecting, and other mining activities, measures should be adopted to prevent ground water pollution.

Article 36: When recharging ground water by artificial methods, it should be ensured that the quality of ground water is not impaired.

Chapter Six: Legal Accountability

Article 37: Any persons or units which commit any of the following offenses violating this law will be warned or fined by the environmental protection sections, or shipping administrative organs of the communication departments in light of the seriousness of the offense concerned:

1. The offense of refusing to register or providing false information in violation of the stipulations worked out by the environmental protection department under the State Council concerning the discharge of pollutants;

2. The offense of going into operation or production prior to the completing water pollution prevention facilities or meeting the regulations and requirements on environmental protection set by the state;

[HK301216] 3. Those who refuse to accept on-the-spot inspection carried out by environmental protection departments or by the relevant supervision and administration departments, or those who employ trickery in the inspection;

4. Those who violate the relevant regulations and rules defined in Chapters Four and Five of this law, and those who store, pile up, discard, dump, or drain off pollutants and waste residue;

5. Those who do not pay the fees for disposal of pollutants or the additional fees for disposal of excess pollutants as defined by the state.

Detailed rules for the methods and amounts of fines are specified in this law.

Article 38: Enterprises and institutions which cause serious water pollution must eliminate pollution within a definite time. Those which fail to finish the work within the set time must pay more than double the charges for disposal of excess pollutants as fixed by the state. In addition, a fine might be imposed on them according to the harm and losses incurred, or they might be ordered to suspend their business or to close down.

Article 38: Enterprises and institutions which cause serious water pollution must eliminate pollution within a definite time. Those which fail to finish the work within the set time must pay more than double the charges for disposal of excess pollutants as fixed by the state. In addition, a fine might be imposed on them according to the harm and losses incurred, or they might be ordered to suspend their business or to close down.

The amount of a fine is decided by environmental protection departments. The order to suspend the business of an enterprise or institution, or to close it down and the decision to instruct them to eliminate pollution within a definite time are given by local people's governments; and the order to suspend the business of an enterprise or institution, or to close it down must be reported to the State Council for approval.

Article 39: A fine is imposed on all enterprises and institutions which cause water pollution against the regulations and rules defined in this law by environmental protection departments or by navigation and administration offices of communications departments according to the harm and losses incurred. If a serious case occurs, disciplinary action must be taken against the relevant responsible persons by departments responsible for the work of local units or of the higher authorities.

Article 40: If the person concerned refuses to accept the disciplinary action taken against him, he can bring action in the people's courts within 15 days of receipt of the notice. If he refuses to accept the disciplinary action taken against him, and does not bring action in the people's courts within the set time, then the offices which took disciplinary action against him can ask the people's courts to force him to accept the action.

Article 41: Units which cause water pollution should bear responsibility for eliminating pollution, and make good the loss to the units or individuals involved.

At the rest of the persons concerned, disputes over responsibility or the amount of compensation can be handled through environmental protection departments or through navigation and administration offices of communications departments. If the persons concerned remain unconvinced by the decision made, they can bring suit in the people's courts. They can even bring suit directly in the people's courts.

A third party must bear responsibility for losses incurred from water pollution which is caused deliberately or by faults.

Units in charge of the disposal of pollution bear no responsibility for any losses incurred from water pollution caused by the victims themselves.

Article 42. No responsibility should be borne for any unavoidable losses from water pollution caused by irresistible natural calamities, even though proper measures are taken in time.

Article 43: If a serious water pollution accident leads to grave consequences in heavy losses of public and private property or heavy casualties in violation of regulations and rules defined in this law, responsibility for the crime must be affixed on the responsible persons concerned in accordance with provision 115 and 187 of the penal code.

Chapter Seven: Supplementary Articles

Article 44: The terms in this law are defined as follows:

1. "Water pollution" means that the nature of waters in terms of chemicals, physics, biology, or radiation changes because of the flow of certain materials; as a result, this affects the proper use of water, harms the health of human beings, destroys the ecology, or causes deterioration of the water.

2. "Pollutants" refers to something which might lead to water pollution.

3. "Poisonous pollutants" refers to certain pollutants which may bring about diseases, abnormal behavior, hereditary diseases, physiological deficiencies, organic deformations, or deaths of living beings or their future generations because microbes enter their bodies directly or indirectly.

4. "Oils" refers to any kind of oils or their refined products.

5. "Water areas for fishery" refers to spawning grounds, bait breeding farms, winter resorts, and migration routes of fishes and prawns, and growing grounds of fishes, prawns, shells, and aquatic plants.

Article 45: Detailed rules for the implementation of this law defined by the environmental protection department under the State Council will be submitted to the State Council for final approval.

Article 46: This law will be brought into effect from 1 November 1984.

CSO: 4008/323

SHEN HONG REPORTS ON WATER POLLUTION LAW DRAFT

HK301029 Beijing RENMIN RIBAO in Chinese 13 May 84 p 2

[XINHUA Report: "Shen Hong Reports on Results of Discussion on Draft of Water Pollution Prevention and Treatment Law"]

[Text] Beijing, 12 May (XINHUA)--At the Fifth Session of the Sixth NPC Standing Committee held on 5 May, Shen Hong, vice chairman of the Law Committee under the NPC, acting on behalf of the Law Committee, gave a report on the results of the examination of the "(Draft) Law of the PRC on Water Pollution Prevention and Treatment."

He said that the NPC Law Committee called a meeting from 6-20 April gathering the views put forth by certain members of the NPC Standing Committee and by the relevant central departments and various areas on the "(Draft) Law of the PRC on Water Pollution Prevention and Treatment" and subjecting the draft to deliberation. Everyone held that the draft is basically ripe and is practicable. Touching on the views calling for major revisions put forth by the Law Committee, Shen Hong said that Article 15 in the original draft says: "All enterprises and institutions that discharge pollutants into bodies of water must conform with the pollution disposal standards set by the State or by a given area." "Those that fall short of given standards should undertake the business of treatment and pay pollution disposal fees set by the State and also hold themselves responsible for the consequences of water pollution." In accordance with views put forth by the Beijing Municipal Administration Committee, Beijing Municipal Environmental Protection Bureau, and other units, which have been repeatedly studied by the Ministry of Urban and Rural Construction and Environmental Protection, to facilitate the conservation of water and promote water pollution prevention and treatment work, enterprises and institutions that directly or indirectly discharge pollutants into bodies of water should pay pollution disposal fees. Those who violate given standards should undertake the business of treatment, and, during the period of treatment, pay pollution disposal fees for violation of given standards. Methods of paying fees and the guidelines for payment should be separately stipulated by the State. Therefore, this rule is revised as follows: "Those enterprises and institutions that discharge pollutants into bodies of water should pay pollution disposal fees stipulated by the state; those who violate given national or local standards for pollution disposal should pay pollution disposal fees for violation of given standards stipulated by the State and also

hold themselves responsible for the business of treatment." He said: Some environmental protection departments have pointed out that at present, certain pollution disposal units have refused to pay pollution disposal fees, and that the relevant environmental protection department has failed to use compulsory means, for that matter. Therefore, in the chapter on "legal responsibility," there is a supplementary rule that those who refuse to pay pollution disposal fees stipulated by the State, or pollution disposal fees for violation of given standards should in serious cases, be given a warning or subjected to a fine. He said that Article 17 in the original draft says: "concerning those enterprises which cause serious pollution to bodies of water and which still fail to meet required standards after the expiration of a specified period of time set for proper treatment, the relevant environmental protection department can refer the case to the organ in charge requesting approval of an order requiring their closure or suspension of operations--doing so in accordance with the State regulations on the right to approve the closure or suspension of operations of industrial enterprises." As administrative fines should be stipulated for those units that fail to meet required standards within a stipulated period of time for treatment, it is improper to order closure or suspension of operations in all cases. If such a rule is put in force, it could not easily be carried out. After a study by us together with the Ministry of Urban and Rural Construction and Environmental Protection, this rule has been deleted. Meanwhile, in the chapter on "legal responsibility," it is stipulated: "Those enterprises and institutions which cause serious pollution to bodies of water and which fail to complete given treatment tasks after the expiration of the stipulated period for treatment can be subjected to a fine depending on the harm or losses caused, or ordered to close down or suspend operations, apart from being required to pay more than twice the pollution disposal fee for violation of given standards stipulated by the State." "The amount in fines should be decided upon by the environmental protection department. An order requiring an enterprise or institution to suspend operations or close down should be issued by the local people's government that has made a decision calling for treatment within a specified period of time. An order requiring an enterprise or institution directly under the central authorities to suspend operations or close down should be approved by the State Council."

He said: Article 45 in the original draft says: "Those people directly responsible for the violation of this rule, causing serious water pollution and creating such serious consequences as heavy losses to public and private property, or casualties, should be sentenced to below 3 months' imprisonment, or subjected to detention, or given a sentence of more than 3 years or under 7 years imprisonment, where the case was especially serious and the consequences particularly bad." Considering that those people causing serious water pollution can be held criminally responsible in accordance with regulations similar to stipulations in the criminal code, this rule is therefore revised, as follows: "Those people responsible for the violation of this rule, causing serious water pollution that leads to heavy losses to public and private property, or personal injuries, or deaths can be held criminally responsible in accordance with stipulations in Article 115 or Article 187 in the Criminal Code."

CSO: 4008/323

RENMIN RIBAO EDITORIAL ON WATER POLLUTION LAW

HK160757 Beijing RENMIN RIBAO in Chinese 13 May 84 p 2

[Editorial: "Seriously Enforce the Water Pollution Prevention and Treatment Law"]

[Text] The "Water Pollution Prevention and Treatment Law of the People's Republic of China," which was examined and approved by the Fifth Session of the Sixth NPC Standing Committee and was promulgated by the president of the country, will come into effect on 1 November this year.

Water environmental protection is one of the important aspects of the entire environmental protection work, which directly affects the rational exploitation and effective utilization of water resources, and has a close bearing on the development of the socialist construction and on the livelihood of the broad masses.

Article 26 of the Constitution stipulates: "The state protects and improves the living environment and the ecological environment, and prevents and remedies pollution and other public hazards." In the years before and after the promulgation of the new Constitution, environmental protection work has made considerable progress, and it has also met with increasing attention from various quarters. However, not all the comrades have a correct understanding of this problem. Even up to the present time, some comrades still think it inevitable that the environment will be polluted in order to carry out production and construction. And some comrades hold that because of the limited financial resources of our country, it is necessary to first carry out production and construction, and then to conduct prevention and treatment of pollution. Some persons even went to realize speeding up development of production and enhancing economic results on the basis of damaging the environment and harming the health of the people. We must rectify these erroneous views which set environmental protection against production and construction, and publicize the guiding ideology of the state on the simultaneous advancement of production and construction and environmental protection, so that all people of the country can fully realize that environmental protection is the national policy of our country and is a strategic task that must be fulfilled, and that all trades and professions, and all people can conscientiously implement the stipulations of the Constitution on protecting the environment as well as the "Water Pollution Prevention and Treatment Law."

In light of the fact that water pollution is rather serious in our country, the "Water Pollution Prevention and Treatment Law" sets forth a series of mandatory regulations on the prevention and treatment of water pollution. First, all new construction items should list the water pollution prevention and treatment facilities in their plans. If these facilities have not been completed or fall short of the required standards, the items will not be allowed to operate. Secondly, the enterprises and undertaking units should discharge their polluting materials to water areas in accordance with the standards of discharge set by the state or by local authorities, and should pay pollution discharge fees. For materials which exceed the standards of discharge, additional fees should be paid as stipulated by the state; with regard to those units which are inactive in treating pollution or cause serious pollution, the people's government at the provincial city, and county levels have the power to make mandatory decisions on treating the pollution within a certain period; as for those units which fail to fulfill the task of treatment within the stipulated time, the environmental protection departments at various levels can impose fines according to the hazards and losses caused, and greater fines will be imposed on units causing greater losses and more serious hazards; and regarding those units which cause very serious hazards which are hard to remedy, the provincial, city, or county governments may order their suspension of operation or closure. The "Water Pollution Prevention and Treatment Law" also stipulates that the units causing hazards of water pollution have the obligation to eliminate the hazards and to provide compensation for those units or individuals directly affected by the pollution.

[HK160759] The "Water Pollution Prevention and Treatment Law" also lays down explicit regulations on handling water pollution incidents. Water pollution incidents mean pollution cases which occur through irresponsibility in management or through violation of regulations in operation, which are different from ordinary water pollution cases. In this respect, the "Water Pollution Prevention and Treatment Law" has laid down comparatively stringent regulations of punishment. Regarding those enterprises and undertakings which have caused water pollution incidents, fines should be imposed with the amount in proportion to the extent of hazards or losses caused; for more serious cases, administrative punishments should be inflicted on those who should be responsible; and with regard to those units which have caused serious water pollution incidents leading to great losses of public or private property or personal injuries and deaths, the relevant persons who should be held responsible may be sentenced to prison terms or detention with forced labor of no more than 7 years on the basis of the seriousness of the case and with reference to stipulations in Article 115 of the criminal law on endangering of public safety, or they may be sentenced to prison terms or detention with forced labor of no more than 5 years with reference to stipulations in Article 187 of the criminal law on malfeasance.

"Laws alone do not operate by themselves." In order to conscientiously implement the "Water Pollution Prevention and Treatment Law," all the relevant departments and units in the country should enhance their understanding, strengthen the publicity work, and adopt practical and effective measures so as to do a good job in the prevention and treatment of water pollution. The

people's governments and environmental protection departments at various levels should coordinate their efforts with the judicial departments, so that laws are observed and strictly enforced, and persons breaking the laws will be punished, with the result that the work of protecting the water environment in our country is fully ensured by law.

CSO: 4008/323

LAW ON PREVENTION, CONTROL OF WATER POLLUTION

Water Pollution Law Adopted

OW112307 Beijing XINHUA in English 0851 GMT 11 May 84

[Text] Beijing, May 11 (XINHUA) -- China's legislature today adopted a law concerning the prevention and control of water pollution. The new law provides that a unit causing water pollution damage has the duty to remove it and compensate the direct victims. Any personnel who violate this law and thus cause a major accident with resultant serious losses to public or private property, casualties or other grave consequences will be held responsible criminally according to the law.

Approved by the Fifth Session of the Standing Committee of the Sixth National People's Congress this afternoon, the Law of the People's Republic of China Concerning the Prevention and Control of Water Pollution applies to such surface bodies of water as rivers, lakes, canals and reservoirs and underground bodies of water within the country. China has a separate law concerning the protection of marine environment.

The new law has 46 articles in seven chapters: General Principles, Establishment of Norms for the Quality of Water Enivronment and for the Discharge of Pollutants; Supervision and Administration of the Work of Preventing and Controlling Water Pollution; Prevention of the Pollution of Surface Water; Prevention of the Pollution of Underground Water; Legal Responsibility; and Supplementary Articles. This law will come into effect on November 1 this year.

Decree on Water Pollution Law

OW130202 Beijing XINHUA Domestic Service in Chinese 0303 GMT 12 May 84

[Text] Beijing, 12 May (XINHUA) -- Presidential Decree No 12 of the People's Republic of China.

"The People's Republic of China's Law Concerning the Prevention and Control of Water Pollution," which was adopted by the Fifth Session of the Standing Committee of the Sixth National People's Congress of the People's Republic of China on 11 May of 1984, is hereby promulgated. This law will come into force on 1 November of 1984.

[Signed] Li Xiannian, president of the People's Republic of China; 11 May, 1984

CSO: 4010/82

CAMPAIGN URGED TO PUBLICIZE NEW POLLUTION LAW

OW191230 Beijing XINHUA in English 0935 GMT 19 May 84

[Text] Beijing, May 19 (XINHUA) -- A nation-wide publicity campaign should be mounted to promote China's new water pollution prevention law, according to a senior official here. Minister of Urban and Rural Construction and Environmental Protection Li Ximing told the CHINA ENVIRONMENT JOURNAL that all departments and people concerned with environmental protection must review their work to make readjustments in accordance with the law. There is also a great need to spread antipollution information, he said.

The law was adopted earlier this month, and will come into effect on November 1. It is expected to help control pollution by sewage, pesticides and other contaminants. "Its publication is a major event in environmental protection work in China." Minister Li said.

Chinese industries discharge a yearly average of 31 billion tons of sewage, containing 130,000 tons of harmful and toxic wastes. Pollution now affects nearly 13 percent of the total length of the mainstreams of China's major rivers. "Pollution is even more serious in the branches of these rivers, especially those running through cities," Li Ximing said.

In some areas pollution control has been neglected in the course of rural industrialization. "All industries must abide by the law, including rural industries," he said.

CSO: 4010/87

NEW NETWORK MONITORS MARINE POLLUTION

OW151534 Beijing XINHUA in English 1459 GMT 15 May 84

[Text] Tianjin, May 15 (XINHUA)--A national network for monitoring marine environmental pollution was set up at a national conference which closed here today.

The network, managed by the Ministry of Urban and Rural Construction and Environmental Protection and the State Bureau of Oceanography, will coordinate pollution-control efforts in nine coastal provinces and municipalities and one autonomous region, as well as State Council departments and army units.

It will monitor and survey offshore pollution sources, gather data and issue pollution warnings. It will provide information for formulating marine laws and regulations and carrying out marine research and help protect offshore environments.

The network is composed of 80 monitoring stations in the Bohai, Yellow, East China and South China Seas, and large numbers of such stations at river mouths and coastal areas.

CSO: 4010/88

REMOTE SENSING USED FOR MONITORING POLLUTION OF JI CANAL

Beijing SHUILI SHUIDIAN JISHU [WATER RESOURCES AND HYDROPOWER ENGINEERING] in Chinese No 9 20 Sep 83 pp 55-59

[Article by Zhu Laidong [2612 0171 2639] of the Chinese Academy of Sciences Applied Remote Sensing Research Institute: "Remote Sensing Analysis of Pollution Drifting Upstream in the Lower Reaches of the Ji Canal"]

[Text] The Ji canal originates at Yan Shan in northern Hebei, flows through Jixian and Ninghe counties and Hangu ward in Tianjin Municipality, and enters the Bohai Sea through the Beitangkou. The low terrain of the shore region has caused extreme meandering in the middle and lower reaches of the Ji canal. Industrial and agricultural production along both banks of the Ji canal is developed, and the population is dense, especially in Hangu ward, in the lower reaches. This is Tianjin's main chemical industry region, the Tianjin Chemical Plant, a large-scale chlorine and soda plant is located here. It daily draws large amounts of water from the Ji canal, and gives off mercury, benzene hexachloride, and other toxic pollutant liquid and solid wastes.

In the spring of 1974, Tianjin's Ninghe County and Hangu ward drew water from the Ji canal for irrigating wheat fields. The result was no production or lower production on over 40,000 mu of wheat fields. This attracted the attention of related departments of the State Council toward water resource environmental protection work in the Ji canal drainage basin. Related scientific research institutes of the Chinese Academy of Sciences and scientific research units in Tianjin Municipality carried out integrated investigations and research on the canal. They gathered data on the sources of pollution, the distribution of the pollutants, and the laws of their movement. Aerial remote sensing experiments were carried out in this region in the spring of 1980. They provided us with the conditions for gaining new knowledge on the utilization of remote sensing methods and for thorough research on water pollution in the Ji canal. This article concerns the analytical results of research on the upstream drifting of pollution in the lower reaches of the Ji canal.

I. Raising the question of upstream drifting of pollution in the lower reaches of the Ji canal.

The lower reaches of the Ji canal at its mouth to the Bohai Gulf is a tidal river. In order to make the most effective use of freshwater resources in the Ji canal, a tidal floodgate was constructed at the mouth of the Ji canal in 1958 (see Figure 1). Normally, the floodgates are kept closed to preserve the freshwater and keep out saltwater. The floodgates are only opened during periods of flooding to drain the water into the sea. In this way, this tidal river was converted into a reservoir canal. In regular natural rivers, upstream water movement during seawater high tides is very simple. However, when a dam is built in a river, the special dynamics of tidal river channel water flow motion undergo changes. Whether or not there is still an upstream movement in the river water at this time, whether or not the river movement is influenced by the tides, and furthermore, what influence the nature of river water movement has on the distribution and migration of pollutants, all become questions of real significance which must urgently be understood for protection of river water resources and utilization of water resources. In the pollution disaster of wheat along the lower reaches of the Ji canal in April and May of 1974, the damaged wheat fields were upstream from the toxic discharge of the Tianjin Chemical Plant. It is quite obvious that the occurrence of this accident is related to the characteristics of canal water movement, and, therefore, that ascertaining the laws of canal water movement is useful for drawing lessons and for avoiding future occurrences of this sort of event.

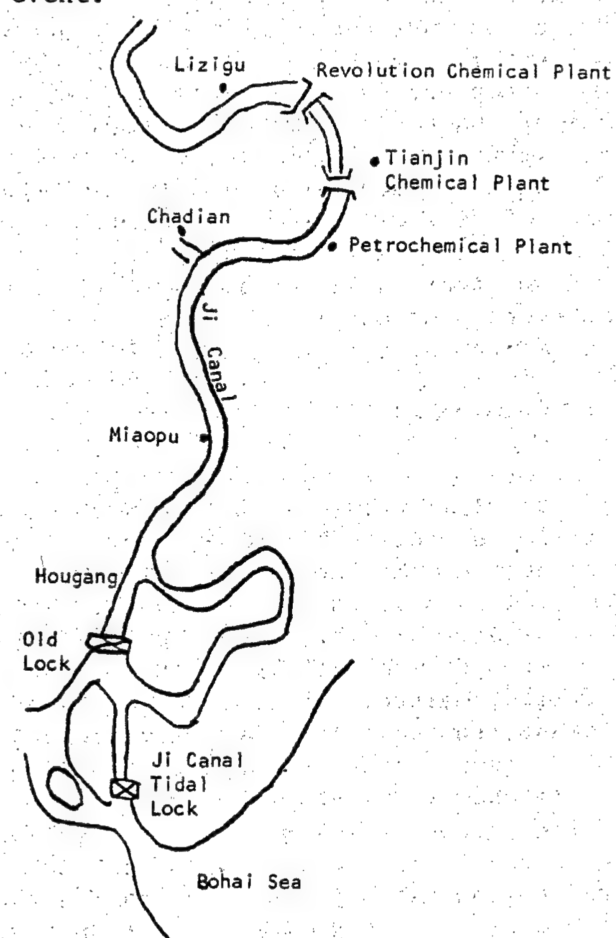


Figure 1. Topography of the Lower Reaches of the Ji Canal

II. River channel water movement remote sensing methods.

The best analysis and research on the direction of water flow in river channels is based on comparative assessment of data from synchronous observation of water flow over a large area. In reality, however, this type of data is hard to obtain. Simply establishing a conventional hydrological observation station at the river mouth of the lower reaches of the Ji canal will not permit synchronous comparison of different places. Neither is it appropriate to use standard remote sensing photographs for assessing river water movement. Because the lower reaches of the Ji canal are a reservoir-like channel and the water flows very slowly, aerial photographs have the characteristics of showing only a homogeneous structure of a single hue. It is very difficult to directly ascertain the direction of water flow movement from above.

Color infrared remote sensing aerial photographs are used for remote sensing of the Ji canal. This type of photograph is especially suited to environmental monitoring. It has the special characteristics of combining both infrared and color photography, and of using distinctive hues to clearly show with infrared light some surface features which cannot be distinguished with the naked eye. On the color infrared remote sensing aerial photographs, suspended silt in the canal water has a clear image. Clear river water in the photographs appears as a deep orchid hue. As soon as silt is added to the water, there is an obvious change in color. As the silt content increases, the color turns light green, light orchid or even grayish-white, and is entirely different from the clear river water. The suspended silt in the river water is formed of fine silt, clay and other particles. It is dispersed and extremely fine, floating along with the water flow. For this reason, silt suspended in river water can serve as an indicator of the direction of water flow movement, and can be used for indirectly ascertaining the direction of water flow in aerial remote sensing photographs.

III. Remote sensing of upstream water flow in the lower reaches of the Ji canal.

By using suspended silt in the river water as an indirect indicator of the direction of water flow, it was discovered from the remote sensing photographs that there is definitely an upstream movement of river water in the lower reaches. Photograph 1 is a color infrared remote sensing aerial photograph of the Chadian section of the Ji canal (for ease in printing, it is printed in black and white). It was photographed by a remote sensing camera on an aircraft at an altitude of 1,500 meters. The dark band in the middle of the photograph is the Ji canal, running from north to south. The dark band on the left bank of the middle section is the Chadian drainage canal, which drains a large amount of farmland irrigation water into the Ji canal. The canal water, which has a high concentration of suspended solids, serves as a natural indicator of the direction of water flow after it enters the Ji canal. The lighter colored region flowing upstream from the drainage outlet in the middle of the Ji canal clearly shows the area of upstream water flow. Figure 2 is an explanatory sketch map of the remote sensing photograph of

Chadian. It can be seen clearly in the map that, due to the initially high rate of flow of water from the drainage canal, the traverse flow exceeds the downstream flow, the result being that it is quickly dispersed across the entire river flow. Afterwards, it forms a whirlpool-like plume, changes direction and is dispersed upstream. By checking meteorological records, we know that it was a clear day with only a light breeze when the aerial remote sensing was done. We can, therefore, assume that this unusual direction of flow of the water draining out of the channel was not created by wind effects. This phenomenon can only be explained in terms of the motive role of water flow in the canal. The upstream flow of the canal water can only result from water in the river moving upstream. Besides the Chadian photograph, the phenomenon of areas in the river flowing upstream can be seen in many places on the remote sensing photographs. From this, we can see the objective existence of the upstream movement of water in the lower reaches of the Ji canal.

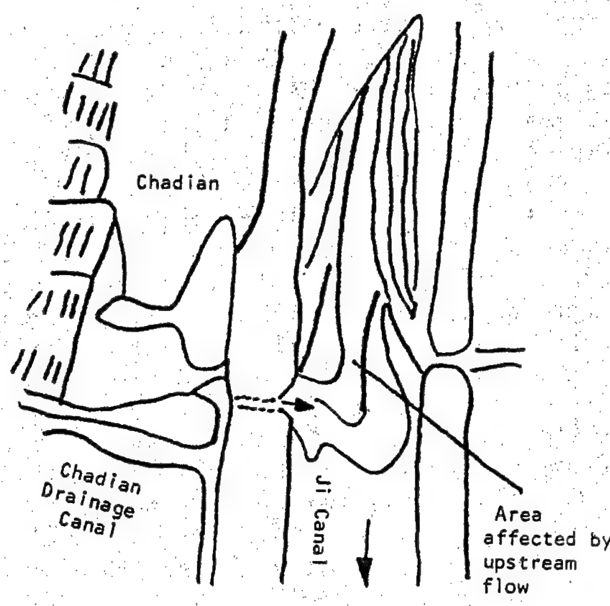


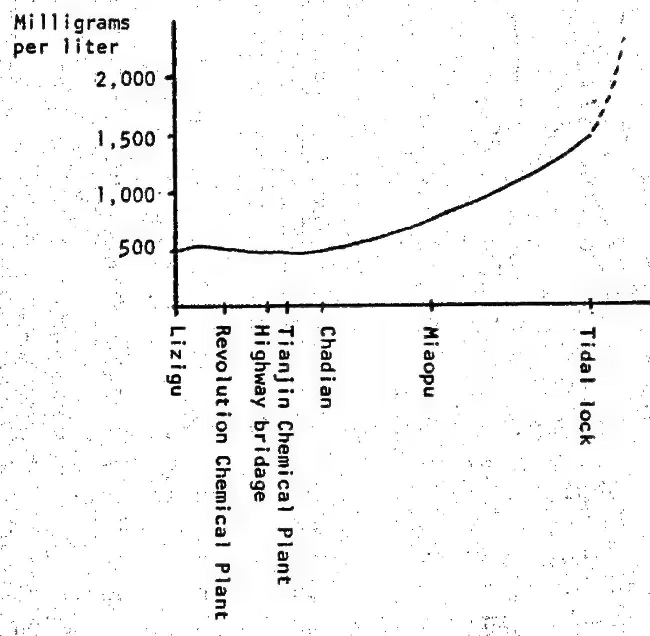
Figure 2. Explanatory Sketch of the Aerial Remote Sensing Photograph of the Chadian Section of the Ji Canal

IV. An inquiry into the reasons for upstream water flow in the Ji canal.

Inquiring into the reasons for upstream movement of water in the lower reaches of the Ji canal is of major importance for clearly understanding the laws of pollutant movement in river water, and for making forecasts of water quality. Because a tidal floodgate was constructed at the mouth of the Ji canal, the ocean tides are cut off when the floodgates are closed. Thus, explanation of the upstream movement of water in terms of the upstream flow of tides does not fit the actual conditions. Furthermore, if the river water was influenced by tidal movements, the river channel water level and the saline content of the water would undergo periodic changes, and the river water salt content should approximate that of seawater when the seawater

flows upstream. These phenomena have not occurred in the water flowing upstream in the canal, however. Figure 3 is a distribution chart showing the salt content of the canal water during the aerial remote sensing. It can be seen from the table that the salt content of river water upstream from the Miaopu observation station is within 500 milligrams per liter, much lower than the salt content of seawater. Although the salt content of the river water increases going downstream from the Chadian observation station, there is not a clear and dramatic change in the boundary between saline and fresh water, nor in salt content. This shows that there is not a large amount of tidewater entering the lower reaches of the Ji canal. Indeed, near the area of the floodgate at the mouth of the canal, the salt content of the water is fairly high, at nearly 1,500 milligrams of chloride per liter of water. On the one hand, this shows that it is possible that a small amount of seawater is seeping in. On the other hand, salt accumulated at the far end of the canal plays a strong role.

Figure 3. Distribution of Canal Water Salt Concentrations in the Lower Reaches of the Ji Canal (Laboratory Tests of Samples Collected May 13, 1980)



The use of another aerial remote sensing photograph for explanation aids in showing that the force causing upstream flow of the canal water is definitely not due to the upstream movement of seawater. Photograph 2 is an aerial remote sensing photo of a downstream section of the Ji canal at Hougang. Hougang is five kilometers downstream from the Chadian canal section shown in Figure 2, even nearer the river mouth than Chadian. Silt is drained into the river channel from the Hougang drainage canal (the black

band at the top of the photo). Figure 4 is a sketch map of the remote sensing photograph of Hougang. It can be seen from the sketch that the silt in the water flows downstream along with the river flow, the opposite of the direction of flow in the Chadian section of the canal. By comparing the remote sensing photographs of the two sections of the canal at Hougang and Chadian, we can learn an interesting fact: upstream from Hougang at Chadian, there are strong upstream forces in the canal water. This proves that the tides are not the force causing the canal water to move upstream.

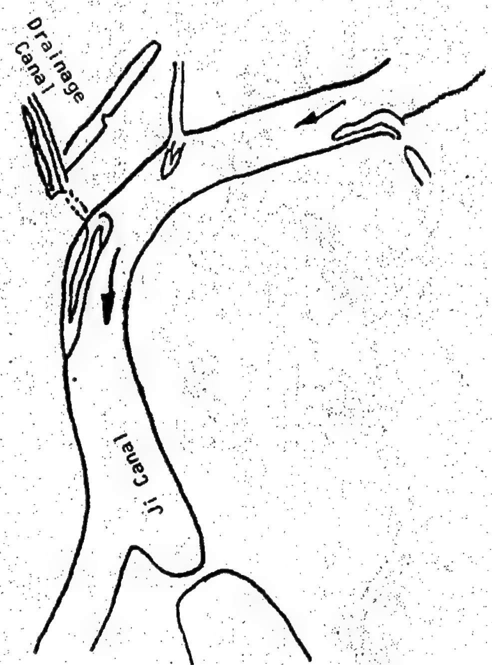


Figure 4. Explanatory Sketch of the Aerial Remote Sensing Photograph of the Hougang Section

By using aerial remote sensing photographs of the entire region of the lower reaches of the Ji canal for comparative analysis and for on-the-spot investigation and research, the author learned that the large amount of water drawn for irrigation upstream forms a down-sloping funnel, thereby causing the upstream movement of canal water. By examining the photographs of the downstream section of the Ji canal, we did not discover that there was a large convergence of water flow in the canal section. Upstream from Hangu, however, several large-scale pumping stations have been built on both banks of the Ji canal (see Figure 5), with a pumping capacity of more than 40 cubic meters per second. The concentration of large-scale pumping stations constructed upstream from Hangu was, on the one hand, done in consideration of their relatively great distance from the river mouth, water quality thereby being better than downstream, and on the other hand, was done in order to avoid the polluted water discharged by the Hangu Chemical Plant. Spring each year is the dry season in north China. Irrigation of spring wheat and rice

seedlings requires the drawing of large amounts of water from the canal. This creates a hydraulic down-sloping funnel downstream on the Ji canal, where it is about 150 meters wide and 3 meters deep, causing the water to flow upstream. The direction of silt flow shown in Figure 5 is based on the results of step-by-step examination of the remote sensing aerial photographs of the region. It shows the direction of water flow at the time the remote sensing photographs were taken, as well as the close relationship it has with the large-scale drawing of water by the pumping stations.

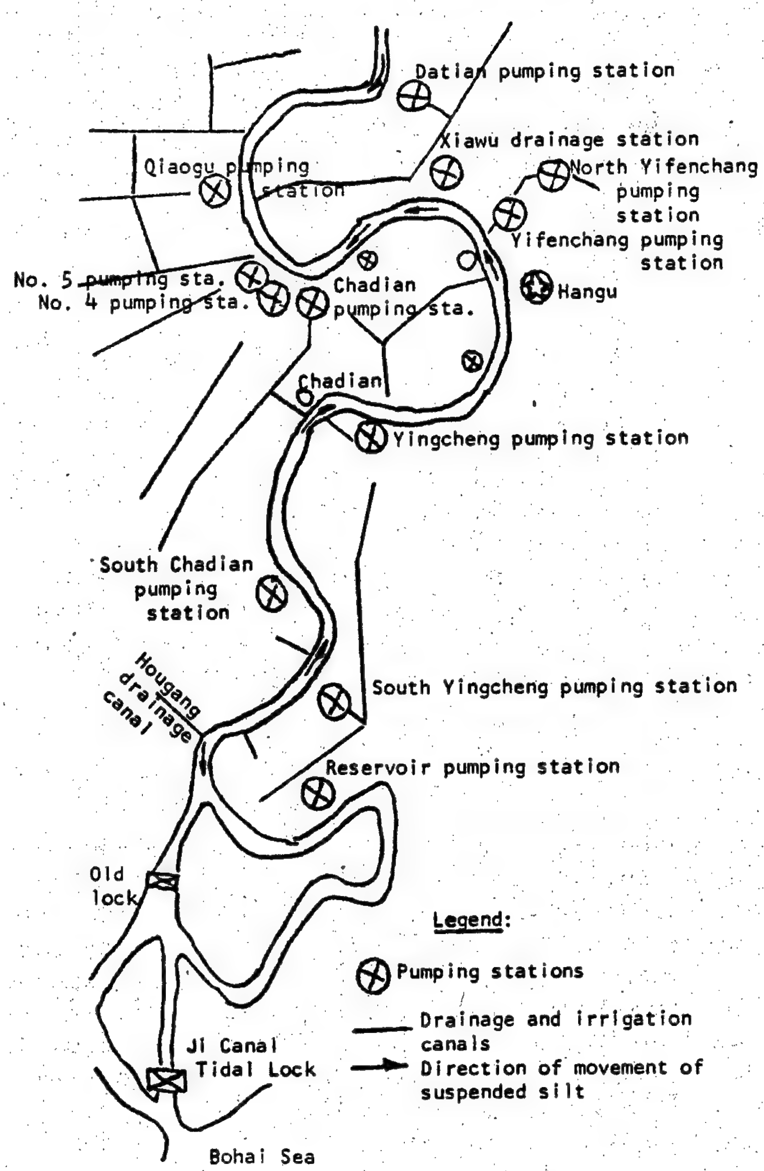
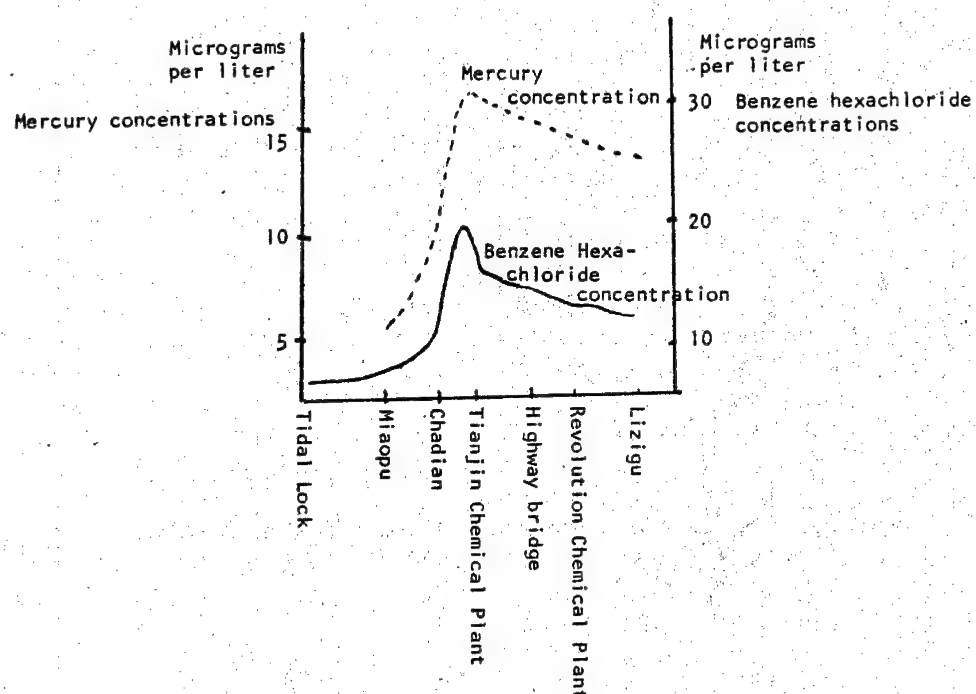


Figure 5. Drainage and Irrigation Systems and Direction of Movement of Suspended Solids in the Water in the Lower Reaches of the Ji Canal

V. Upstream drifting of pollutants in the lower reaches of the Ji canal.

The pollutants in the canal water are discharged by sources of pollution along the river. The concentration, distribution and migratory movement of the pollutants in the canal water are influenced by the direction of water movement in the canal. In normal rivers, the concentration of pollutants is higher downstream from where they are discharged than upstream from the pollution discharge point. If upstream movement exists in the river water, however, the discharged pollutants can migrate along with the movement of the water and influence upstream areas. Based on on-the-spot investigations, the source of discharged mercury, benzene hexachloride and other pollutants in the region of the lower reaches of the Ji canal is the Tianjin Chemical Plant. Figure 6 shows the distribution of pollutant concentrations in the canal upstream and downstream from the chemical plant's water discharge point. It can be seen from Figure 6 that the pollutant concentration upstream from the chemical plant is higher than it is downstream. This abnormal phenomenon is the result of influences of the upstream flow of canal water. Photograph 3 is a remote sensing photo of the direct discharge of waste water into the canal by the Tianjin Chemical Plant. The chemical plant is in the lower left portion of the photograph.

Figure 6. Distribution of Mercury and Benzene Hexachloride Concentrations in the Water in the Lower Reaches of the Ji Canal



After the accident in the spring of 1974, when a large area of wheat in the Hangu ward died, it was learned through analysis of laboratory tests that the reason the wheat died was the result of pollution by waste water carrying trichloroacetic aldehyde and sodium hypochlorite that was discharged into the canal by the Tianjin Chemical Plant. Wheat fields irrigated with groundwater at that time were not affected.

In his book "Density Currents," Professor Qian Ning [6929 1337] reported a case of factory relocation in America's Tennessee River. In the past, America's Tennessee River was an uncontrolled, destructive river. There was serious soil erosion on both banks, and there were frequent floods. In 1933, with support from President Roosevelt, the Tennessee Valley Administration was established to carry out regional planning and construction. Several tens of locks and dams were built along the river for flood prevention and for utilization of river water for power generation and irrigation, forming a reservoir-like river channel. Several factories along the river discharged polluted water directly into the river. Because the upstream factories were drawing a great deal of water, a reverse current was created in the river water. This forced several factories to change the places where they drained water or drew water, or to relocate. This incident on the Tennessee River is quite similar to the damage to wheat from the Ji canal in China.

VI. The role of suspended silt as an indirect indicator for analysis of hydrological remote sensing.

In the analysis of the upstream flow forces in river water in the lower reaches of the Ji canal, the suspended silt in the canal water played an important key role as an indirect indicator in the aerial remote sensing photographs for ascertaining the direction of water flow. In reality, regardless of whether it is in aerial remote sensing or satellite remote sensing photographs, silt suspended in the water provides a great deal of useful information. Quite a few important results have been obtained both at home and abroad by using suspended solids for research on current direction along sea coasts, on the position of freshwater pouring from the mouth of a river, on the sources of silt in reservoirs, and in other areas. In monitoring of urban water environments, suspended solids can be used to trace the sources of pollutants and the direction of their dispersal, and to discover concealed pollution sources. America used data from Landsat photographs for discerning 0.7 percent differences in concentrations of suspended silt content in the surface layer of the Gulf of Mexico. In the aerial remote sensing photographs of the lower reaches of the Ji canal, we can distinguish differences in the photograph within 10 milligrams per liter of the suspended solids in the water, and furthermore, we can use them for research on the characteristics of water motion in the lower reaches of the canal. This is also an example of hydrological remote sensing analysis.

[Three photos are omitted]

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CSO: 4008/57

NORTHERN DIVERSION PROJECT ASSESSED

Beijing DILI YANJIU [GEOGRAPHICAL RESEARCH] in Chinese No 3, Sep 83 pp 87-95

[Article by Ge Weiya [5514 4850 0068], Lo Xueqi [5012 1331 4388], and Tang Peiwen [0781 0160 2429] of the Hydrology Department, Chang Jiang Valley Planning Office, Wuhan: "A Preliminary Assessment of the Water Resources Diverted Northward From the Chang Jiang Drainage Basin"]

[Text] The Chang Jiang has always been regarded as an important water resource. In addition to supplying the water needs of the basin, can some of its water be diverted to north China? This is a crucial question in discussing the feasibility of diverting southern water northward. There is no doubt that at present there is much excess water in the Chang Jiang, the fact that in the especially dry year of 1978, the annual volume of water at the Datong Station was still more than 600 billion m^3 is strong evidence. Looking ahead to sharp increases in various kinds of water usage in the Chang Jiang basin at the end of the 20th century will this lead to a situation in which we cannot make ends meet and thus lose any possibility of water diversion?[1] This is a matter of interest to the people.

How to evaluate water resources of the northern diversion from the perspective of the volume and quality of Chang Jiang water not only can answer in a preliminary way the question of the possibility of Chang Jiang water diversion, but also can explore its feasibility.

To solve this problem it is first of all necessary to analyze the quality and characteristics of volume of water resources of the Chang Jiang system, estimate the volume of Chang Jiang water use at the end of the 20th century, and on this basis carry out an assessment of the water resources of the Chang Jiang diversion.

I. Volume Characteristics and Quality of Water Resources of the Chang Jiang System

Water in the Chang Jiang system is supplied largely by atmospheric precipitation and groundwater. For many years the average annual rainfall in the basin has been about 1,050 mm, with the largest annual rainfall at 1,380 mm, and the smallest at 650 mm, the annual rainfall variation coefficient Cv is generally between 0.20 and 0.25, thus it is clear that the changes from year to year are stable. Yet, changes in annual rainfall by district are very

evident: in some districts of Jiangsi, which has more rainfall in the basin, the average annual rainfall is about 2,150 mm. In the headwaters of the Chang Jiang where rainfall is sparse, the average annual rainfall is only about 300 mm, or a seven-fold gap. Changes in rainfall within a year are even clearer than changes from year to year. The flood season rainfall in a year is about 80 percent of annual rainfall, and of that the main flood season accounts for about 60 percent of the annual rainfall, while the dry season rainfall accounts for only 20-40 percent.

The changes in volume of water resources of the Chang Jiang system and their features are mainly influenced by such factors as rainfall and human economic activity. Through statistical analysis of actual measurement of mean runoff and extended serial sections and overall synchronous serial sliding mean analysis it can be discovered that at the Datong Station, the mean annual runoff before liberation was high, and after liberation it was lower; the results of synchronous serial analysis of the Yichang and Hankou stations is similar, see Table 1.

Table 1. Estimation of Mean Annual Runoff Before and After Liberation

Station name	Serial mean before liberation (100 million cu. m.)	Serial mean after liberation (100 million cu. m.)	Absolute difference of mean (100 million cu. m.)	Relative difference of mean (percent)
Yichang	4,570	4,320	250	5.5
Hankou	7,510	7,130	380	5.1
Datong	9,430	8,920	510	5.4

To explore further the important causes of the above described phenomenon, it can be discovered from similarly carrying out a sectional statistical analysis and comprehensive serial sliding mean analysis of annual (surface) rainfall series for areas above Yichang, Hankou, and Datong, that apart from the area above Yichang where the mean annual rainfall has diminished only slightly since liberation compared to before liberation, for the area above Hankou or Datong is just the opposite: the post-liberation mean is higher than the preliberation mean, as detailed in Table 2.

From this it can be seen that in terms of the entire basin the influence of human economic activity after liberation is an important factor in the diminishing of the annual mean runoff.

According to preliminary estimates, present economic activity has caused a reduction of approximately 64 billion m^3 in the mean annual volume of water, and this figure shows that post-liberation economic activity, in which increased use of water conservancy and farmland capital construction dominates,

Table 2. Estimate of Mean Annual Rainfall Before and After Liberation

Basin	Serial mean before liberation (mm)	Serial mean after liberation (mm)	Absolute difference of mean (mm)	Relative difference mean (percent
Above Yichang	943.7	941.1	2.6	0.3
Above Hankou	998.8	1,039.2	-40.4	-4.0
Above Datong	1,059.9	1,108.9	-49.0	-4.6

has had an impact on annual runoff. Ths impact has caused the annual runoff series to lose its consistency as a contributing factor before and after liberation and the statistical characteristics also to lose their seasonal stability.

The mean annual runoff of the Chang Jiang basin for many years under natural conditions, as measured at the Datong Station unaffected by economic activity and estimated from extended data, was 943 billion m^3 or 29,900 m^3/s. Including the annual runoff of the area below Datong, for many years the mean annual runoff of the entire basin was about 1,000 billion m^3. The mean annual runoff of an abundant year at the design guarantee rate P=20 percent is about 1,120 billion m^3; the mean annual runoff at P=50 percent is about 991 billion m^3; and the mean annual runoff of a dry year at P=80 percent is 866 billion m^3.

As was said above, though in quantity runoff from the Chang Jiang is influenced primarily by rainfall and economic activity, it demonstrates the characteristics that change from year to year are rather stable and distribution within a year and within a region is very uneven. The annual runoff variation coefficient Cv for the Chang Jiang is about 0.15, much smaller than for China's other rivers. The reasons for this are its large watershed, and that rainfall and shallow water supplements frequently do not have the same periodicity thus causing a lack of periodicity in supplementing the volume of water in the water systems in the entire basin and the formation of runoff. The greatest measurement of annual quantity of water of the Chang Jiang (using the Datong Station as representative) was 43,100 m^3/s (1954), which is equivalent to 1,360 billion m^3, and the smallest amount measured was 21,400 m^3/s (1978), equivalent to 675 billion m^3, or about a 1-fold discrepancy between the two. In terms of distribution of runoff within a year, the quantity of water during the Chang Jiang's flood period (April-October) is about 80 percent of the annual quantity, the main flood period (May-August) makes up about 60 percent, and the dry season (November-March) makes up about 20 percent. In terms of regional distribution of annual runoff, in the upper reach above Yichang, the area of control is about 56 percent of the entire basin and the mean annual runoff accounts for 46 percent of that of the entire basin; the area of control in the middle reach between Yichang and Hankou is 27 percent of

the entire basin and the mean annual runoff makes up 29 percent of that of the entire basin; the area of control of the lower reach from Hankou to Datong is 12 percent of the entire basin and the mean annual runoff accounts for 20 percent of the entire basin. From this it can be seen that in terms of its large area, the quantity of water produced per unit of area in the Chang Jiang basin increases from the upper reaches to the lower reaches, and this point is entirely consistent with the regional distribution of annual rainfall. However, the water quantity control conditions are just the opposite, becoming scarcer from the upper reaches to the lower reaches due to topographical and other factors, thus creating great discrepancies in the degree of utilization of water resources within the basin. In addition, the breadth of the Chang Jiang basin, the fact that the mainstream is long and the water system developed, numerous lakes and high density of river networks also causes the proportion of static water resources in the basin to be large. According to preliminary estimates, the annual water storage capacity of the Chang Jiang channel is about 250 billion m^3, or about one-quarter of the dynamic water resources, the replacement cycle of the water resources of its system is about 90 days; the enormous static water resources of the Chang Jiang and its long replacement cycle also make it second to none among China's many rivers.

A system's water resources includes the two important aspects of quantity and quality. Industrial, agricultural and domestic uses of water not only place certain demands on water quantity, they also place certain demands on water quality. Even in areas where water is abundant when deterioration of water quality poses a serious danger to industrial and agricultural production and people's physical health this abundant water is of no significance in terms of expanding usage. Due to rapid development of industry, in the more than 30 years since the PRC was founded large amounts of industrial waste water from industrial and mining enterprises and urban domestic sewage has been discharged into the Chang Jiang and its tributaries so that the water quality in some sections of the Chang Jiang and its tributaries has deteriorated by the day and the health of the inhabitants and the industrial production of some areas and cities has been threatened to varying degrees.

At present, according to incomplete statistics,[2] there are over 40,000 sources of pollution in the entire basin. The annual mean volume of industrial water usage is about 7 billion m^3, and domestic water usage is about 4.8 billion m^3. The industrial waste water and domestic sewage discharged annually is about 10.8 billion m^3, making up about 1 percent of the average volume of water in the Chang Jiang. In terms of the distribution of the areas of pollution sources, of the 13 provinces and municipalities, Hubei has the most, Shanghai is next, and Jiangsu is third; in terms of the distribution of areas of volume of discharge of sewage, Sichuan is the most numerous, Jiangsu and Hubei are next and Shanghai is third. Of the various industrial and mining enterprises, the volume of sewage from metallurgical, chemical, and light industrial firms accounts for 53 percent of all the sewage.

The pollution of the Chang Jiang mainstream extends for over 800 km,[2] or about 1/8 of the length of the Chang Jiang mainstream, and about 1/4 of the section of river (from Dukou to Shanghai) in which the pollution sources are

concentrated. The sewage discharged into the Chang Jiang and its tributaries contains large quantities of pollutants, including such metallic pollutants as mercury, cadmium, chromium, lead, zinc, and copper and nonmetallic pollutants such as arsenic, fluorine, phosphorus, and such organic pollutants as phenol, cyanide, petroleum, organic chlorine, organic phosphorus, and wood, and in addition to the pollutants there are acids and salts.

The pollutants which are discharged into the mainstream and tributaries in the basin move from upstream to downstream along with the current and some are purified and some are diluted. Some are held by reservoirs and lakes, some are carried away when drawn through certain measures for other industrial, agricultural, and domestic uses. And some are increased in concentration by the discharge of sewage in down river sections. So the situation is extremely complex.

According to analysis of measurements taken in 1978 at 10 monitoring stations in the Chang Jiang estuary, the quality of the water in the Chang Jiang estuary is unsatisfactory. The basic water quality, public health, and harmful substances norms have already been exceeded for 8 of the 11 monitoring categories, or 67 percent of the total, with rates of excess ranging from 2 percent to 37.5 percent. The rate of excess of mercury is the greatest, copper is next, and phenol is third. The water quality of the Huangpu Jiang, which is a tributary of the Chang Jiang, is even worse: on the basis of analysis of the 1978 results from 4 monitoring stations on the lower reaches of the Huangpu Jiang within the city, all of the 11 monitoring standards were exceeded, with rates ranging from 4.3 percent to 100 percent, the rates for phenol and copper being prominent.

Through the above analysis the following characteristics of the quality of water resources in the Chang Jiang estuary can be determined:

1. Some sections of the Chang Jiang are already polluted to varying degrees. The pollution of the estuary and the Huangpu Jiang is not easy to ignore, but the two pollution situations are different. The highest rate of excess in the Huangpu Jiang is ammonia nitrogen and oxygen consumption. Yet in the Chang Jiang they are in seventh and fifth place respectively; the highest rate of excess in the Chang Jiang is mercury, but the rate of excess in mercury content is only in the Huangpu Jiang. In addition, the characteristic values of ammonia nitrogen, oxygen consumption, and dissolved oxygen (annually largest, smallest, and average) and the size of the rate of excess can be clearly seen: at present the ability of the Chang Jiang estuary to purify itself is still strong and although the water quality is polluted by organic substances, it is still slight. In terms of the average situation the content of organic substances is not high and basically conforms to the public health norms for ammonia nitrogen content. The situation with the Huangpu Jiang is different: its ability to cleanse itself is poor, and the content of organic substances is also high, thus the water quality is seriously polluted by organic substances.

2. In terms of the pollution situation in the Chang Jiang mainstream and the estuary, the greatest threat to quality of water resources presently is

that the mercury content is too high. Although the annual discharge of mercury in the basin is not great,[3] since mercury accumulates in the river year by year it could gradually increase the seriousness of water quality pollution.

3. Since the concentration of pollutants can be diluted by water, there is a certain relationship between quality and quantity of water resources. Taking the volume of mercury in the Chang Jiang estuary as an example, in 1978 the frequency of exceeding the norms was 4.4 (the average of 10 monitoring stations), and the greatest number occurred in the dry season months of January, February, October and December, accounting for 91 percent of the rate excesses, but in the main flood period months of June to August there were very few cases when it exceeded the standards.

4. The chloride content of the water is influenced both by industrial waste water and domestic sewage as well as by tidal water, and the concentration of chloride in the Chang Jiang estuary reflects these two influences. According to statistics of the 1978 results of 10 monitoring stations in the Chang Jiang estuary, 2/3 of the tidal months when the content was above 100 mg/l were in January-March and November-December when the Chang Jiang water quantity was small. The average tidal month for the Chang Jiang estuary in 1978 was about 7 months. The high chloride content and the length of the tidal period is rare in China's rivers which empty into the sea.

In view of the dialectical relationship between quantity and quality, from the angle of water resources, it is necessary to improve the quality of water resources which are deteriorating daily, and it is also possible. The pollution prevention critical flow at Datong station derived for relatively small quantities to restrict pollution densities from exceeding the criteria on the basis of an analysis of the materials from 10 monitoring stations in the Chang Jiang estuary in 1978 (representative situation) are given in Table 3.

From Table 3 it can be seen that the pollution prevention critical discharges and the rate of excess beyond the standards in the same section of river are different, and proceeding from the angle of pollution prevention in the Chang Jiang estuary alone, if the permitted rate of excess beyond the standards for pollution prevention critical discharge was fixed at 15 percent, and over 60 percent of all the items reached this level, according to this standard, according to Table 3, in the end the pollution prevention critical discharge set for the Chang Jiang estuary would be about 13,000 m^3/s, i.e., the discharge at Datong station could not be less than this figure.

However, the above pollution prevention standards are specifically determined, in terms of its determination, it is rational. From the angle of water resources, it raises the question of correcting the deterioration of water quality. At the same time as improving water quality from the angle of water resources, actively adopting treatment of the "three wastes" and other forceful measures for industrial waste water and domestic sewage and provide reliable guarantees for improving the quality of water resources.

Table 3. Computation of the Critical Discharge Exceeding the Criterion in Pollution on the Chang Jiang Estuary (Q, m^3/s)

Category / Characteristic value	Average value		Below limit value		Above limit value	
	Flow	Rate exceeding standards	Flow	Rate exceeding standards	Flow	Rate exceeding standards
Water quality pH	29,200	0.05	11,300	0.05	38,200	0
Public health norms						
Ammonia nitrogen	15,000	0.01	11,300	0.02		
Oxygen consumption	18,300	0.01	11,300	0.02		
Dissolved oxygen	19,300	0.01	9,790	0.02		
Hazardous substances						
Cyanide	11,300	0	11,300	0		
Arsenic	11,500	0	11,500	0	38,200	0
Phenol	20,300	0.09	9,930	0.21		
Chromium	35,200	0.01	26,800	0.01		
Mercury	12,800	0.24	9,790	0.62	15,800	0.11
Copper	28,400	0.11	11,500	0.42		
Chloride	15,300	0.29	9,790	0.53	25,900	0.06

II. Analysis of Future Water Quantity Usage of Chang Jiang Water Resources

With the constant development of China's four modernizations, by the year 2000 the Chang Jiang basin will also experience a large growth in various water uses.[5]

The total population of the basin in the year 2000 is projected at 370 million, including 319 million peasants and the area under cultivation will be 374 million mu. Of the area under cultivation the irrigated area will amount to 97 percent: 94 percent of which will be irrigated by river water and 3 percent by well water; 85 percent of the irrigated area will be in double crop rice and 3 percent in rice and wheat in rotation. The proportion of dry farming area will be 12 percent and the multiple crop index is 1.93.[6]

The irrigation norm for paddy rice and dry crops will be set overall in reference to the analysis of previous surveys we have conducted and data from relevant units. The average annual overall irrigation norm derived from these irrigation norms, weighted for area, is 688 m^3/mu. For dry years it is 831 m^3/mu.

Average annual water use for irrigation is 300 billion m^3. For dry years it is 360 billion m^3.[7]

Estimating the industrial use of water at the end of the 20th century in the basin is an extremely difficult task. It can be adjusted only roughly. Taking into consideration the fact that by the year 2000, industry and agriculture will both be more developed, the estimate was made using industrial water use data for Shanghai and Nanjing which are both rather highly developed industrially, i.e., using the comparative value of the average annual volume of water used for industrial purposes in Shanghai and Nanjing from the period right after liberation to today and the volume of water used for industrial purposes in the period right after liberation as a projection norm, we projected that the volume of water used for industrial purposes in the entire basin in the year 2000 will be 210 billion m^3 annually.

For water used for domestic purposes in the basin we referred to the relevant data from abroad and for eight cities in the basin. As a preliminary figure we used 500 liters/day/person as a figure for urban domestic water usage, and 200 liters/day/person for rural domestic water usage. On this basis we estimated that water used for domestic purposes in the basin in the year 2000 would be 33 billion m^3/year.

In addition to the above described uses of water for irrigation, industry and domestic purposes, we also focused on the actual situation in which the quality of the water in the Chang Jiang is deteriorating daily. It is necessary to adopt appropriate measures to improve this situation. From the perspective of water resources, in addition to controlling pollution sources and the pollution burden effectively, such engineering and technological measures as regulating runoff, increasing dry season flow, and channeling good water into areas where water quality is deteriorating can be adopted to improve the quality of water resources. Thus, it is necessary to consider diluting the water volume used for pollution prevention. In exploring the question of the possibility of the Chang Jiang diversion, it is first of all necessary to consider improving the water quality situation in the lower reaches of the Chang Jiang, in particular in the Chang Jiang estuary. It is necessary to insure that the Shanghai area which is in first place in the nation in gross value of industrial and agricultural output is not harmed by the process. According to analysis, the critical discharge at the Datong Station to make the Chang Jiang estuary reach the pollution prevention standards is about 13,000 m^3/s. To counter deterioration of water quality, this characteristic generally occurs during the dry season. In 1964 when the dry season water volume was P=50 percent and 1957 when P=80 percent are selected as models, and an equilibrium calculation is made of the water volume before and after the construction of the Three Gorge Project at a rate of 13,000 m^3/s. The results are in Table 4.

Table 4. Computation of the Diluted Water Volume Used for Pollution Prevention Before and After the Construction of the Three Gorge Project on the Chang Jiang.

Design frequency P (percent)	50		80	
Project status	Before Three Gorge Reservoir Construction	After Three Gorge Reservoir Construction	Before Three Gorge Reservoir Construction	After Three Gorge Reservoir Construction
Diluted water volume used for pollution-prevention (100 million m^3)	40	0	170	40

The above projections of water use for irrigation, industry, domestic purposes and dilution for pollution prevention are all expenditure of water volume. It is also necessary to do some estimating in terms of water volume recovery. Here we take into consideration the four items of the volume of irrigation water returned, the volume of water saved through developing sprinkler economies, and the volume of industrially used and domestically used water which is returned.

According to analysis of data from the long operating Kai Jiang Runoff Experiment Station and repeated observations of water conservancy programs, the coefficient of average annual irrigation water returned is 0.40, or 0.35 for dry years. If we overlook the discrepancy in volume of water returned in the last 2 months of last year and the first 2 months of this year, the average annual volume of irrigation water returned is 120 billion m^3, and 126 billion m^3 for dry years.

To sum up what has been said above, the details of the overall water volume supplied at the level of long-range plan before and after construction of the Three-Gorge Project are in Table 5.

III. Analysis of the Feasibility of Water Supply by Diverting the Chang Jiang

Speaking in the broad sense, analysis of water supply by diverting water from the Chang Jiang basin is, in essence, a comprehensive scientific and objective technical and economic demonstration of the feasibility and practicability of proposals concerning the northward diversion of water from the south and at the same time a discussion of the changes brought about in the natural environment and the ecological system by the northward diversion of water from the south; the aspects involved are very broad and very complex. Here we are only making a preliminary evaluation of the question of water supply by diversion of water from the Chang Jiang basin from the angle of the water resources of the Chang Jiang system.

Table 5. Estimation of the Water Volume Supplied at the Level of Long-range Plan (Unit: 100 million m^3)

Item	Normal level water year	Dry year
Quantity of water expended		
Water used for irrigation	2,400	2,900
Water used for industry	2,100	2,100
Water used for domestic purposes	330	330
Water used for pollution prevention	$\frac{40}{0}$	$\frac{170}{40}$
Gross quantity of water used	$\frac{4,870}{4,830}$	$\frac{5,500}{5,370}$
Quantity of water recovered		
Water recovered from irrigation	1,200	1,260
Water saved from spray irrigation	40	50
Water used for industry	1,470	1,470
Water used for domestic purposes	230	230
Net gross quantity of water used	$\frac{1,930}{1,890}$	$\frac{2,490}{2,360}$

Note: The numerator in the fraction represents the volume of water used before the construction of the Three Gorge Project, the denominator represents the volume of water used after construction of the Three Gorge project.

An analysis of the influencing factors and the trends in changes of the serial average of annual volume of water in the Chang Jiang shows that due to the influence of water conservancy measures, the serial mean value of annual volume of water after liberation declined about 6 percent compared to the serial mean before liberation, a difference of approximately 64 billion m^3. Thus, taking 1 trillion m^3 average serial value of the annual volume of water in 1985, which was derived by extension from before liberation, as a basic characteristic of the volume of water resources of the entire Chang Jiang system under natural conditions has practical significance. This value has uniformity and stability and can be used as one piece of data for exploring the issue of whether or not there is more excess water volume at present and in the future. Yet due to the influence of varying degrees of water conservancy construction, there is no uniform foundation for annual volume of water to use the time about liberation or after liberation as a series for deriving the average annual volume of water. Moreover, due to the changes that took place with time, the average of the series is also unstable. Thus the mean annual volume of water derived from these series has lost any significance.

Since some data from this basin was used, the estimate of the volume of water which will be used in the Chang Jiang basin at the end of the 20th century still has a certain validity. However, in this estimate, to prevent underestimating the volume of water used and thus reaching the erroneous conclusion that there would still be an excess of water in the Chang Jiang, intentionally high values of usage were adopted in the norms for various types of water usage in the basin at the end of the 20th century. This can be seen from the following:

1. The values adopted for irrigation quotas for various crops and the comprehensive irrigation quota are high.

2. The irrigated area as a proportion of the area under cultivation is very large, approximately 79 percent, and about 92 percent of this area is irrigated by rivers; about 85 percent of the area irrigated by rivers is double-crop irrigated area.

3. The average per person area of fields insured of stable yields despite drought or excessive rain in the rural areas at the end of the 20th century will be about 4 times greater than at present.

4. The proportion made up by volume of industrially used water is very large, being about one-half of water used for all purposes. This proportion approaches or exceeds the present levels of such countries as those of Europe, the United States and Japan.

5. The quota for domestic water usage in cities and rural areas is high, the quota for domestic water usage in cities being near or exceeding the levels for the capital cities of the countries of Europe, the United States and Japan in the mid-sixties, and the quota for domestic water usage in the rural areas being close to or exceeding the present levels of the large and medium-sized cities on the middle and upper reaches of the Chang Jiang.

6. The use of water for purposes of dilution in pollution prevention has also been taken into account in the gross volume of water usage.

After comparing the quantity of water used and the quantity of water drawn from the entire Chang Jiang basin, one can see that by the end of the 20th century, even though the volume of various usages increases abruptly, the Chang Jiang will still have excess water, thus there is no danger of exhausting the water resources in terms of quantity, even when there is a drought where P=80 percent in the Chang Jiang, there will still be an excess of water as can be seen in Table 6.

If we make the quotas in the estimate of water usage even higher as the upper limit of the volume of water usage in the Chang Jiang basin, the comprehensive irrigation quota is raised to 1,000 m^3/mu and in addition consider all the land under cultivation as area irrigated by the river, the quota for water used for domestic purposes is not differentiated for urban or rural and uniformly adopt 1,000 liters/person/day, and use the original figures for water used for industrial purposes and water used for pollution prevention, the

Table 6. Water Balance Computation for the Chang Jiang (in 100 million m^3)

Characteristic year	Volume of water drawn	Volume used	Volume of excess
Normal year	10,000	1,930 / 1,890	8,070 / 8,110
Drought year	8,660	2,490 / 2,360	6,170 / 6,300

Note: The numerator in the fraction represents the volume of water before construction of the Three Gorge project, the denominator represents the volume of water after construction of the Three Gorge project.

excess water in the water resources of the Chang Jiang system is still very large and diversion of water is entirely possible.

Viewed in terms of the quality of Chang Jiang water resources, the differences between the various proposals to divert water from the south to the north is exceptionally clear. The eastern route is a headwork project for raising water by electric power with no regulatory function, it can only play a role in transferring water volume in terms of space but cannot play a favorable regulatory role on Chang Jiang runoff in terms of time. Quite the contrary. Since the volume of water transferred in dry seasons makes up a considerable proportion, moving water by the eastern route increases the unevenness of distribution of the volume of Chang Jiang runoff within the year. Not only is this the case, but moving water by the eastern route diminishes the volume of runoff in the downstream reach of the Chang Jiang mainstream and thus increasing the concentration of various pollutants in the mainstream below Jiangdu causing the further deterioration of Chang Jiang water quality. The central route is a headwork project for gravity feeding of the Danjiangkou Reservoir. It not only plays a role in shifting the volume of water spatially, but also plays a regulatory role in distribution of Han Jiang runoff within the year. As set forth in Table 7, after the construction of the Danjiangkou Reservoir, the volume of flow in the dry season increased, and it will have a certain diluting function with regard to the pollutant content of the mainstream in the middle and lower reaches of the Chang Jiang. After the central route proposal for diverting southern water northward is implemented, though the volume of flow released by the reservoir in dry seasons will be less than the natural volume of flow before the construction of the Danjiangkou Reservoir, the difference in volume of flow will be less than with the eastern route proposal.

According to analysis, under conditions where other pollution prevention measures cannot be implemented in this basin before the construction of the Three Gorge Reservoir, when the volume of flow at the Datong Station is less than 13,000 m^3/s, shifting water by the eastern route may even cause the Shanghai reach of the Chang Jiang to exceed pollution prevention standards:

the seriousness of the deterioration of water quality in the Shanghai reach of the Chang Jiang in 1978 is strong proof of this. During this year [1978] the average annual volume of flow of the Chang Jiang at the Datong Station was 21,400 m^3/s, corresponding to a dry year where P=97 percent, the average volume of flow in the dry season months was 9,790-15,800 m^3/s, the Jiangdu Pumping Station operated 270 days in succession and pumped about 6.3 billion m^3 of Chang Jiang water, the other pumping stations along the river in Jiangsu all were in operation, the locks along the river were opened promptly, and with the addition of the temporary pumping stations, the volume of water drawn along the river in Jiangsu was about 30 billion m^3, and the volume of water drawn along the river in Anhui below Datong was about 6 billion m^3. The volume of water drawn along the river between Datong and Shanghai was about 36 billion m^3, still close to 30 billion m^3 which is the greatest volume of water to be transferred by the eastern route. Under these conditions, this is an actual examination of the problem of deterioration of water quality which will be caused in the Shanghai section of the river with the eastern route diversion. Central route diversion is completely different: the construction of the Danjiangkou Reservoir long ago became fact and the volume of water on the lower reaches has not yet diminished, and thus has not caused the deterioration of water quality in the central and lower reaches of the Chang Jiang mainstream. The scale in the early period after the diversion (157 meter proposal) only changes the proportion of the water supplied for generating electricity and for diversion from the reservoir's original storage capacity and has no essential impact on the volume of water in the lower reaches of the Chang Jiang. The ultimate scale after the central diversion (170 meter proposal) is even less likely to have an unfavorable impact on the lower reaches after the construction of the Three Gorge Reservoir.

Table 7. Monthly Mean Discharge at Low Flow Period After the Construction of Danjiangkou Reservoir on the Han River

Month	1	2	3	11	12	Notes
Before construction	284	277	472	743	429	38 year average 1930-1967
After construction	535	514	557	727	538	11 year average 1968-1978
Later period of central route diversion	200	200	200	200	200	

Through calculations, after the construction of the Three Gorge project, the volume of flow at the Datong Station during January in dry seasons of drought years will still be less than 13,000 m^3/s, and thus for the section of river at Shanghai in January of drought years it will still be necessary to adopt other pollution prevention measures to be able to meet pollution prevention standards. This problem does not exist with the central route.

A comparison of the situation in handling water source and water quality in the eastern route and central route headworks reveals that there is a definite difference between the two water diversion proposals. According to a survey analysis of the Northward Diversion of Southern Water Source Pollution Survey Research Group of the Ministry of Water Conservancy and Power, the water pollution in the vicinity of the Jiangdu headworks is severe. The mercury content exceeds the surface water standard by about six-fold. Further, according to analysis of 1978 data, the phenol content of the Zhen Jiang section of the river in the dry season exceeds the standards by about two-fold, the oxygen consumption and dissolved oxygen were far below the standards stipulated. The water quality monitoring items for the central route headworks at the Danjiangkou Reservoir are given in Table 8. From this it can be seen that the water quality on the central route is excellent.

Table 8. Analysis of the Water Quality Monitoring Data for Danjiangkou Reservoir on the Han River

Item / Season	pH	Dissolved oxygen	Oxygen consumption	Phenol	Cyanide	Arsenic	Chromium
Flood	8.0	5.7	6.4	0.0006	0.005	0	0
Dry	7.9	8.5	7.7	0.003	0.016	0	0.0003

Summing up what has been said above, evaluating supplying water by diversion from the angle of water resources of the Chang Jiang system, the following preliminary knowledge can be derived:

1. By the end of the 20th century, the Chang Jiang will still have much excess water which can satisfy the quantity of water needed for the diversion of water northward;

2. Viewed from the perspective of the headworks regulatory function, the eastern route diversion reduces the flow of the lower reaches of the Chang Jiang and thus causes further deterioration of dry season water quality;

3. To improve the water quality of the Shanghai section of the Chang Jiang and reach a certain pollution prevention standard, before the construction of the Three Gorges Reservoir, and at the same time while it is still not possible to implement pollution prevention measures on the Chang Jiang, it is not appropriate for water diversion by the eastern route when the volume of flow at the Datong Station is less than 13,000 m^3/s;

4. Seen from the angle of evaluation of water resources, the central route diversion does not cease to be a better proposal;

5. As long as comprehensive control and management of the water resources of the Chang Jiang basin is strengthened the impact of northward diversion of water on the deterioration of the water quality of the Chang Jiang may be resolved and should not become an obstacle to the northward diversion of water.

NOTES

1. "Is the Northward Diversion of Water From the South Really Necessary," GUANGMING RIBAO, 1 August 1979, p 4; Zhou Kaige [0719 0418 2960], Chen Si [7115 1835] "The Northward Diversion of Water From the South Should Not Be Started Hurriedly," RENMIN RIBAO, 13 August 1979, p 2.

2. Estimate of volume of future water usage in the Chang Jiang Basin, Hydrology Office of the Chang Jiang Basin Planning Office, SHUIZIYUAN YANJIU, 1980.

3. Ibid.

4. Report of a survey of the pollution burden of the Chang Jiang mainstream, Chang Jiang Water Resources Protection Bureau, 1980.

5. Estimate of volume of future water usage... op. cit.

6. Basic data on comprehensive utilization and control of the Chang Jiang basin (discussion draft), Comprehensive Section of the Planning Office of the Chang Jiang Basin Planning Office, 1979.

7. Estimate of volume of future water usage... op. cit.

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8226
CSO: 4008/41

IMPACT OF GROUNDWATER EXTRACTION IN BEIJING-TIANJIN REGION SURVEYED

Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 8, 1983 pp 2-3

[Article by Wei Zhongyi [7614 1813 5030] and Ren Hongzun [0117 7703 6690]: "Environmental Impact of Extracting Groundwater in the Beijing-Tianjin Region"]

[Text] The Beijing-Tianjin region includes Beijing Municipality, Tianjin Municipality and Langfang Prefecture, Hebei. This region is densely populated, has well-developed transportation and a high level of production and is China's political, economic, and culture center. Since the founding of the nation, the volume of water used has steadily increased along with the development of socialist construction, and the demand for water is high, surface water along can no longer satisfy the demand and groundwater is becoming an increasingly important water source. But the extraction of a large volume of groundwater has caused a series of environmental problems. Therefore, an urgent task of today in the Beijing-Tianjin region is the proper evaluation and rational exploitation and utilization of groundwater resources.

Groundwater Resources

Groundwater is primarily the water stored in the cracks and pores of rock layers. In terms of the hydrogeologic conditions, the water-bearing layer in the Beijing-Tianjin region has the following unique features.

From the base of the mountain to the coastal plains the thickness of the Quatenary period sediment increases from tens of meters to 600 meters, the particle size changes from coarse to fine, the number of layers increases and the ability to recharge groundwater gradually becomes poorer. Using the amount of groundwater replenished per square kilometer (coefficient of replenishment) as a criterion, we may divide the groundwater resources in this region into five areas: (1) The plains at the base of the mountains are rich in groundwater. The plains at the base of the mountains north of Sanhe, Shunyi and Daxing counties are extremely rich in groundwater, the coefficient of replenishment is as high as 350,000-500,000 cubic meters per square kilometer per year in the water-bearing layer made of pebble, grit and clay. (2) The freshwater areas of the alluvial and diluvial plains are rich in groundwater. The water-bearing rock layer in the fresh water

region in Baodi, Xiange, Tongxian and Gu'an counties consists of grit and sand, it is thin and layered and has a replenishment coefficient of 170,000-350,000 m^3/yr.km^2. (3) The lower part of the alluvial plain with abundant groundwater and a distribution of salt water. The groundwater bearing layer in the area near Wuqing and Wenan counties consists of fine particles and almost all the shallow layer groundwater has a salt water content greater than 2 g/l. Shallow fresh water only exists near the ancient river channel. The pressure bearing water, located at a depth of 40-60 meters, has a replenishment coefficient of 120,000-170,000 m^3/yr.km^2. (4) Coastal plains southeast of Tianjin Municipality where the shallow layer has salt water and the deep layer is not rich in fresh water. In this region the water bearing layer is fine grained silt sand and fresh water is only distributed near the ancient river channel with a replenishment coefficient of 50,000-120,000 m^3/yr.km^2. Groundwater in most of this region is a body of salt water and up to now has not been made use of. (5) Mountain region. The groundwater in this area is mostly bedrock fissure water and the replenishment coefficient is 50,000-100,000 m^3/yr.km^2. Groundwater in this area flows through fissured rocks and supplements the plains downstream.

The extraction of groundwater is concentrated in the plains region. Its main sources of replenishment are rainfall, rivers, streams and irrigation water. Calculation shows that the total volume of freshwater in this region is 3.76 billion cubic meters and 70 percent of it comes from rain water. The distribution of replenishment sources is quite uneven, 65 percent of the sources are concentrated in the Beijing area, 11 percent in the Tianjin area and the rest are in the Langfang area.

Extraction of Groundwater

The groundwater is mostly used in agriculture, industry and daily life. Consumption by agriculture is the highest.

The irrigation area in the Beijing-Tianjin region is 14.76 million mu and, according to 1978-1980 statistics, 60 percent of the area uses well water for irrigation and consumes 2.3 billion cubic meters of water; this accounts for 30 percent of the total water usage in agriculture. The groundwater usage is especially high in dry weather and some of the areas have shown overextraction in recent years.

Industrial use of groundwater is mostly attributed to metallurgical, electric power, chemical, machinery and textile industries. The total consumption of groundwater by industry is 897 million cubic meters or 41 percent of the total usage of industrial water. Industrial consumption of water is concentrated mainly in Beijing and Tianjin and their suburbs; the extraction of groundwater by industry is still increasing rapidly.

City residents use approximately 430 million cubic meters of groundwater [per year] which accounts for 87.8 percent of the total water consumption in cities for daily living. Beijing residents are allowed to use 192 liters per person per day; for Tianjin residents it is 73.5 liters. These amounts fall far short of satisfying the increasing needs of water in people's daily life and the supply of residential water must be further improved.

In summary, the Beijing-Tianjin region uses a total of 3.6 billion cubic meters of groundwater, out of which 800 million cubic meters are deep layer groundwater. In terms of users, agriculture uses 63.4 percent, industry uses 24.7 percent and residential use is only 11.9 percent. In terms of area, Beijing extracts 2.17 billion cubic meters, Tianjin extracts 890 million cubic meters and the Langfang area extracts only 570 million cubic meters.

Environmental Problems Caused by Irrational Extraction of Groundwater

If the groundwater extracted in production activities can be replenished within a reasonable period and the level of groundwater can be maintained at a proper level, then the extraction of groundwater not only solves a part of the water supply problem but also leads to desirable changes in the environment (such as improvements of saline-alkali soil and swamp land). However, if the extraction of groundwater is unplanned and exceeds the replenishment ability, then it will not only exhaust the groundwater reserve but also cause the following environmental problems:

(1) Funnel: when the extraction and replenishment of groundwater in a region maintain a balance in one or more years, the groundwater level will be roughly constant. If the average extraction exceeds the average replenishment for many years, the level of groundwater will gradually drop and a funnel will form at the most developed region. Even when the overall depletion and replenishment in a region are approximately in balance, a series of local funnels may still form due to irrational and concentrated extraction of groundwater.

Since the 1970's, Beijing and its near suburbs have been an area of overextraction of groundwater. In this area the groundwater replenishment is 600 million cubic meters per year whereas the depletion rate since 1976 has been 400 million cubic meters per year. The dried-out volume of the water bearing layer has reached 1.7 billion cubic meters and a groundwater funnel covering a 1,000 square kilometer area has formed, the average drop in water level was 4-5 meters. Water in the eastern Beijing funnel zone has been dropping at a rate of 1-2 meters per year and the center of the funnel has a water level as deep as 30 meters. If the groundwater continues to be exploited without control, there is a possibility that the water bearing layer may soon dry out completely.

Due to changes in the hydrogeologic conditions and the invasion of sea water, the shallow groundwater in the Tianjin area is salt water with a high mineral content and is unsuitable for drinking. Only the deep pressure-bearing water is the main source of drinking water. The current rate of extraction is 600 million tons per year, of which 400 million tons are overextracted. A 7,000 square kilometer funnel zone centered in the downtown area has formed. The water level at the center of the funnel is 60 meters lower than the peripheral water level and the rate of drop is 1.5-4.4 m/yr. Funnels are also gradually forming in Langfang prefecture and in Dacheng and Wen'an counties. The Dacheng funnel has an area of 762 square kilometers and suffered a water drop of 2.5 meters.

(2) Ground settlement: Sediments of the Quatemary period are rich in porous clay and mud; once the water is extracted from the pores, the sediment shrinks and the ground settles under the heavy load of the upper layer.

Measurement showed that the average ground settlement in Tianjin city and parts of the suburb is 800 mm and settlement exceeds 1000 mm in a 100 square kilometer area. Settlement is most serious near the Tianjin north station where the accumulated settlement from 1959-1982 was more than 200 mm and the maximum settlement per year was 210 mm. At a water level standard point in Tanggu ward, the settlement rate before 1974 was 14 mm/yr and increased to 98 mm/yr from 1974-1976. Surveys made in recent years have shown that the industrial zone east of Beijing has also suffered various degrees of settlement.

Funnel and ground settlement may also lead to other problems such as exhausted groundwater, well pump failure, underground pipe rupture, low land water accumulation, water quality deterioration and sea water invasion. Such problems have in recent years attracted the attention of responsible departments and measures have been taken to prevent the further spread of funnels and ground settlement.

First, artificial refill may be applied to existing funnels and ground settlement to restore them, the source for refill is mostly surface water. For example, deep well refill experiments have been conducted in Dazhigu since 1967 and the level of groundwater restored 5.9 meters in 3 years.

Next, based on the principle of broadening the sources and conserving use, groundwater extraction in overextracted areas should be cut back. Effective approaches to broaden the water sources include "bringing the water of Huang He into Tianjin", "bringing the water of Luan He into Tianjin", bringing the water in the south to the north, and constructing new surface water and groundwater reservoirs. Effective measures to cut back on water usage include reducing water-intensive industrial and agricultural production projects and cutting back on water usage allotment.

(3) Water quality deterioration and pollution: Water quality is as important as water quantity in the evaluation of water resources. In the Beijing-Tianjin region, overextraction of groundwater has lead to the invasion of deep layer salt water and sea water, and seepage of untreated industrial effluent in the ground has caused the water quality to deteriorate. There is also pollution caused by nitrates and other toxic substances.

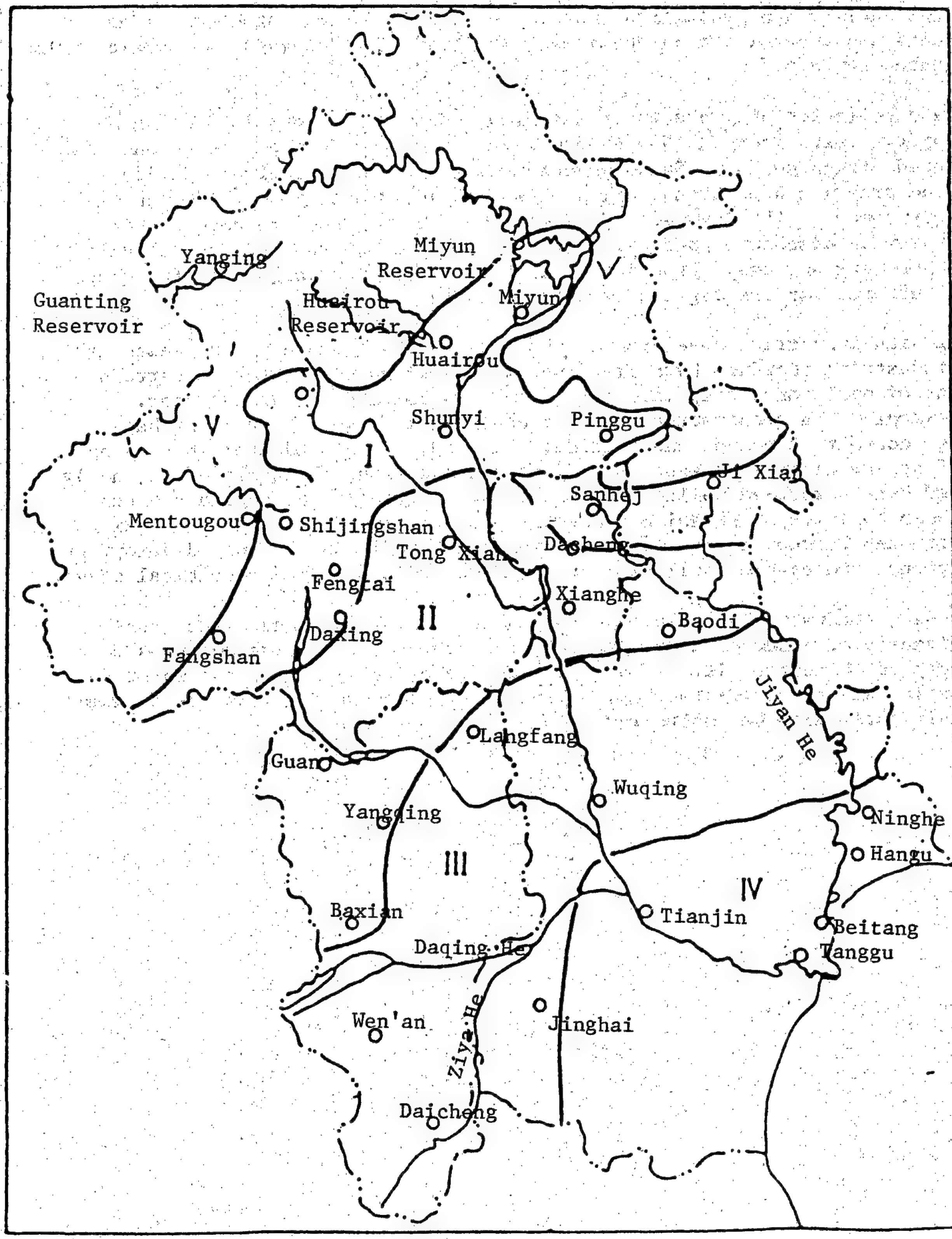
The hardness of groundwater in Beijing Municipality and suburbs has been increasing at a rate of 0.5-1.0 German degrees per year (1 German degree= 0.357 milligram equivalent per liter). The groundwater has exceeded standards in an area of 200 kilometers. Three of six water plants have exceeded the standard (25 German degrees for drinking water) and the other three are approaching the standard. The hardness and mineral content of shallow groundwater in Tianjin municipality are quite high and hardness exceeds the standard by 71 percent. Water quality at other cities is also gradually deteriorating. Water hardness has a direct effect on human health,

and the quality and production cost of certain industrial products. The connection between water hardness and cardiovascular diseases has particularly attracted concern.

Nitrate pollution of groundwater has also been very serious in Beijing and vicinity. Tests made in 1980 showed that the nitrate content in groundwater exceeded standards in a 200-kilometer area distributed mostly in Beijing and the area south of Lianhuachi. This was caused mainly by the discharge of city sewage. The Hucheng He, Tonghui He and Liangshui He have become major sewage discharge waterways for the city and suburbs and the pollution has been very serious. Groundwater in Tianjin and Langfang Prefecture has also suffered various degrees of nitrate pollution.

Along with industrial development, the three wastes (waste water, waste gas and industrial residue) have also increased. Along with water, a certain amount of pollutants seep into the ground and pollute the groundwater. For example, the groundwater in the industrial zone west of Beijing has a high content of phenol and cyanide. In 1980, the groundwater in an area of 20 square kilometers east of Shijingshan and along the banks of the newly opened canal exceeded pollution standards. In Tianjin the second aquifer has been polluted by phenol and arsenic, especially in the Zhengzhuangzi, Dazhigu and Tangkou area. Although Langfang City is still under development, the phenol and cyanide pollution of groundwater has reached a critical stage.

Because groundwater is polluted, the people's livelihood and agricultural and industrial production is threatened; therefore, effective measures must be adapted to control it. In addition to the prevention of groundwater pollution due to overextraction, pollution of groundwater by wastes in human activity must also be controlled.



Schematic diagram of groundwater resources in the Beijing-Tianjin region

Legend:

I. The plains at the base of the mountain are rich in groundwater.
II. Alluvial and flood plains, fresh water region, rich in groundwater.
III. Lower alluvial plains, comparatively rich in groundwater with salt water distribution.
IV. Coastal plains, upper layer salt water, deep layer, limited amount of fresh water.
V. Mountain region.

9698
CSO: 4008/1

PROTECTING BEIJING'S WATER RESOURCES

Beijing HUANJING BAOHU [ENVIRONMENTAL PROTECTION] in Chinese No 12, 1983 p 7

[Article by Cao Xingrong [2580 0992 2837]: "A Plan to Protect Beijing's Water Resources"]

[Text] Water resources in the Beijing area are, primarily, groundwater and surface runoff, both derived from local rainfall, and secondarily, runoff that originates in parts of Hebei and Shanxi Provinces and flows into the city via such inter-province rivers as the Yongding He, Chaobai He, and the Juma He.

At present, surface water resources that can be harnessed for use in the Beijing area amount to 2,200 million m^3 in a normal year, 1,500 million m^3 in a slightly dry year, and 850 million m^3 in a dry year. Miyun and Guanting Reservoirs make up 90 percent of the surface water resources that can be harnessed for use.

The bulk of area groundwater resources are stored in the alluvial plain of the river system comprising the Yongding He, Chaobai He, Beiyun He, Juma He and the Gou He. About 2,500 million m^3 can be tapped.

After Liberation, industrial and agricultural development and urban construction have been accompanied by a rapid increase in water consumption. The combined industrial and urban domestic consumption reached 1,700 million m^3 in 1980, a 40-fold increase over pre-Liberation days. In the past two years, as a result of a prolonged drought and inadequate water resources, the entire municipality has mounted a water conservation campaign which has trimmed industrial and urban domestic consumption considerably. In 1982, industrial and domestic consumption dropped to 1,410 million m^3.

At present, a normal year basically yields enough water to satisfy the needs of industry, agriculture and urban living. In a slightly dry year, however, supply falls short of demand, especially in Beijing with its heavy concentration of industry and population. Industrial and urban domestic consumption accounts for 80 percent of the total municipal consumption, the main suppliers of which are the Guanting Reservoir and groundwater. In recent years, there has been a steady drop in the volume that the Guanting Reservoir can deliver. And, for several years now, groundwater

in the city has been over-exploited. This gap between supply and demand can only be widened by a worsening water pollution problem.

To ease the water shortage and to control water contamination, Beijing Municipality, first and foremost, should try to ensure the safety of drinking water right now. Next, we should improve the water quality of the rivers and channels that carry water into the area. The following points should be noted if we are to succeed in the above tasks:

1. Set up water resource protective zones. At present, Beijing depends mainly on groundwater in the city's urban areas and in Shunyi Niudangshan for its domestic water supply. To protect the quality of such resources, the western part of Beijing and the adjoining area between Miyun, Huairou, and Shunyi to the north of Shunyi Niudangshan should be declared a key protective area. In the future, units that pollute the environment will not be permitted to build here, other construction will also be under strict control. Existing pollution problems in this area must be treated by a set date.

From now on, urban domestic consumption should gradually rely on the Miyun Reservoir. The plan is for the reservoir to be the main source of urban domestic water in the Beijing area by the year 2000. The Miyun and Huairou Reservoirs should be designated key protective surface water zones. Polluting units are to be strictly kept out of the upper reaches of the reservoirs. Trees should be extensively planted in the hilly areas to help conserve soil, store and purify water.

The Guanting Reservoir is the major water supplier of industries in Beijing. The reservoir is also a major supplementary source of domestic water for the Mentougou area and of groundwater in the urban areas. Henceforth, we should improve protection, and strictly monitor water quality to prevent pollution.

2. Management must be strengthened to ensure a proper sewage system where polluted and clean water will be separated. The rivers and channels in Beijing Municipality should be classified in accordance with their functional capabilities. Rivers and channels that supply water, e.g., the Chaobai He, Jingmi Channel, and the Yongding He diversion channel, should be carefully managed to keep out sewage. In rivers and channels that supply and drain water, e.g., Nanbei Hucheng He and the upper part of the Tonghui He, interceptor works must be gradually put in place to separate clean water from sewage. The city's sewage system must be slowly improved to upgrade the urban environment and eliminate foul-smelling rivers and channels.

3. Sewage treatment and comprehensive utilization. Industry and urban domestic sewage account for much of the water pollution in Beijing municipality. In 1981, almost 2 million m^3 of sewage were discharged daily in the outskirts of Beijing. In principle, each factory is to dispose of its own sewage. Once the prescribed amount is reached, the plant can discharge the excessive amount into the drainage system. Plants that are heavy water users and produce a large amount of sewage should gradually

aim to recycle waste water themselves so that pollution can be disposed of in the production process. Urban domestic sewage is dealt with collectively by the city's sewage treatment plants. Sewage treatment plants are planned to be built at Gaobeidian, Zhengwangfen, Xiaohongmen, Qinghe, Jiuxianqiao, Lugouqiao, Nanyuan, Dingfuzhuang and Fatou, etc. Treatment will differ according to the requirements of the urban environment and the uses of the water after treatment. There are three such uses: 1) for irrigation along the lower reaches of the rivers in the city; 2) as a water resource to feed the lower reaches of the rivers; and 3) miscellaneous urban uses. In this way we will be able to protect urban water resources, improve the urban and rural environment, and make full use of water resources.

12581
CSO: 4008/127

BEIJING RESIDENTS URGED TO CONSERVE WATER

OW041359 Beijing XINHUA in English 1323 GMT 4 Apr 84

[Text] Beijing, April 4 (XINHUA) -- Beijing residents are today urged to cut water consumption down to the minimum this year as a long dry spell in the Beijing area has reduced reservoir supplies and groundwater to dangerously low levels. The save-water call was issued by Vice-Mayor Zhang Baifa at a rally attended by 13,000 people. Most of the 70 reservoirs on the city's outskirts are dry. Miyun Reservoir, the biggest in the northeastern area of the municipality, has a storage capacity of 4.3 billion tons. It now has only 1.15 billion tons of water. The amount of water used annually in both urban and rural Beijing has surpassed the output of usable surface water and extractable groundwater, and the groundwater table in the municipality has dropped five meters since the end of the 1960s. At present, 1,100 units in Beijing, including factories, shops, government institutions, colleges and universities, each with a monthly consumption of over 5,000 tons, are on restricted water supply plans. Beijing's general petrochemical works, iron and steel complex and chemical plants have installed water recycling facilities. In these units, the re-utilization rate of water for industrial use is 70 percent. Approximately 520,000 water meters have been installed in one-third of residents' homes and apartments in the city. This work is continuing. Some specialists have proposed diverting water from the Yangtze and Yellow Rivers to Beijing, Vice-Mayor Zhang Baifa said.

CSO: 4010/82

JILIN CALLS ATTENTION TO SERIOUS WATER SHORTAGE

SK160412 Changchun Jilin Provincial Service in Mandarin 1030 GMT 15 Mar 84

[Text] According to our reporter (Tan Tieyin), the provincial conference on urban water conservation concluded today after a 3-day session. It urged various localities, units, and the vast number of people to make concerted efforts to do a good job in controlling, using, and conserving water sources, and conduct the work of thoroughly saving water on a long-term basis.

Liu Shulin, vice governor of the province, attended and addressed the conference.

The conference pointed out: Our province suffers from a serious shortage of water sources, which has developed into a strained situation in water supply. This has seriously affected industrial production and the people's livelihood. If we fail to dea with the problem successfully, it undoubtedly will affect social stability and the program of achieving the four modernizations. Therefore, we must clearly understand the threat to us by this water shortage and regard water conservation as the state's policy and an important strategic measure for achieving the four modernizations. A good job should be done in grasping this work.

The conference stressed: To conduct effective water conservation in urban areas across the province, it is imperative to understand the guiding ideology and work emphasis clearly, to strengthen leadership over the work, make overall arrangements, conduct unified management, and establish or improve the regulations and rules in this regard. We should concentrate on arousing the key industrial enterprises to upgrade the utilization rate of surface water and rationally and scientifically develop underground water. Various localities should continuously heighten their understanding on the importance of water conservation and should do a good job in earnestly conducting propaganda education on water conservation. Efforts should be made to strengthen the protection of water sources, control existing pollution, and prevent new pollution. It is necessary to consume water in a planned manner in order to conserve water and to improve the water supply for residents.

The conference summed up and exchanged experiences gained by the province in the work of water conservation and commended a number of advanced units and individuals who are outstanding in water conservation.

CSO: 4008/206

WATER QUALITY IMPROVES IN SONGHUA JIANG

Beijing RENMIN RIBAO in Chinese 24 Nov 83 p 2

[Article: "Water Quality Improves in a Section of the Songhua Jiang--Practice Unified Leadership, Strengthen Effective Management"]

[Text] After undergoing 5 years of active control, water quality in a section of the Songhua Jiang which suffers from severe pollution has improved. Schools of fish have reappeared in the river and fish output is beginning to be restored.

The Songhua Jiang is the river with the most abundant water resources in the Northeast. For several years, the party and the state have been concerned about pollution in the Songhua Jiang. Comrade Zhou Enlai personally inquired about pollution in the Songhua Jiang in 1960. In 1978, the state established a small leadership group for protection of the Songhua Jiang river system with participation by responsible people from Jilin, Heilongjiang, Nei Monggol and related ministries and committees of the State Council. They broke through administrative boundaries, carried out unified leadership and speeded up progress in pollution control. More than 200 million yuan has been invested in recent years for controlling over 100 major sources of pollution. The small leadership group also adopted administrative, economic, legal and other measures to carry out effective management of water resources in the Songhua Jiang. Improperly situated and severely polluting enterprises were closed down, moved or economically sanctioned. For new construction, reconstruction or expansion projects, pollution prevention facilities were required to be designed, constructed and put into operation at the same time as the main project. In this way, the occurrence of new sources of pollution was controlled.

12539
CSO: 4008/84

POLLUTION OF RIVER IN YUNNAN BROUGHT UNDER CONTROL

Kunming YUNNAN RIBAO in Chinese 8 Jul 83 p 1

[Article by Hu Tiande [5170 1131 1795]: "Control of Pollution of the Tanglang Chuan Shows Initial Success"]

[Text] Good news has been received about controlling pollution in the Tanglang Chuan: the discharge of toxic substance has been brought within the limits of state standards; the water has become clear, and fish are being bred in some sections of the river.

After leaving Haikou, the water from Dianchi flows northwestward to the hot spring area and Fumin County and then enters the Jinsha Jiang. The section from Haikou to Fumin County is called the Tanglang Chuan, and is approximately 93 km long. The section below Fumin, approximately 200 km long, is called Pudu He. The Tanglang Chuan was originally called Haikou He. It was changed to Tanglang Chuan simply because it has some sandbars that resemble mantises. In the past, the water of this river was clear and teeming with fish and shrimp in addition to having an abundance of reeds. Approximately 50,000 mu of farmland in the counties of Anning and Fumin was formerly irrigated with water from the Tanglang Chuan, and people living along the river enjoyed this benefit for a long time. After liberation, more than 70 factories, mines and enterprises were built along this river, and 260,000 tons of contaminated water were discharged into the river each day. This contaminated water contained large quantities of phenol, cyanogen, flourine, mercury and other toxic substances. About the time when the "gang of four" was smashed, the river water turned black, and fish and shrimp disappeared.

The central, provincial and the Kunming municipal governments have shown great concern over the problem of pollution of this river. In 1982, Premier Zhou visited Kunming and gave this instruction: "The problems of Dianchi and the Tanglang Chuan must be solved." In 1978, the province held a work conference to deal with the problem of pollution in the Tanglang Chuan and decided on the plan, policy and task for its control. A leading organ and an observation station were set up for this purpose. In the past several years, more than 60 measures were taken for the treatment of the "three wastes." Economic and administrative measures were taken in dealing with those enterprises whose pollution control was ineffective.

How shall we consolidate and expand our achievements and guard against retrogression in the control of pollution? This was what our correspondent learned from the meeting conferring citations for pollution control in the Tanglang Chuan: The environmental protection departments of the province and the city have compiled a list of all items concerning the pollution of the river in varying degrees and notified the enterprises concerned. A time limit has been set for the pollution to be brought under control, failing which, these enterprises will be severely dealt with according to the environment protection law.

9411
CSO: 4008/196

INDUSTRIAL WATER CONSERVATION DISCUSSED

Beijing RENMIN RIBAO in Chinese 30 Jun 83 p 3

[Article by Zhu Jicheng [2612 3444 2052] of the Beijing Hydrogeology and Engineering Geology Co: "Industrial Water Conservation: An Important Way To Settle the Issue of Strained Water Supplies in Cities"]

[Text] Water is the blood of industry. But the use of water in industry strains urban water supplies. In Beijing, for example, nearly 900 million tons of groundwater is exploited or used by urban and suburban industry, agriculture and water companies. Among these, industry uses nearly 500 million tons but recycles only about 40 percent of the water it uses. In other words, about 300 million tons of water are drained away through sewers. This not only wastes a large amount of valuable water resources but also increases the volume of sewage discharged.

The situation in Beijing illustrates that industrial water conservation should be regarded as an important means of resolving the problem of urban water supply sources. According to data from home and abroad, industrial water conservation is mainly implemented in the following ways.

The Reuse of Cooling Water. Popularizing the technology of cooling towers and cooling ponds in plants will facilitate reuse of much cooling water. This technology needs only minimal investment and gets quick results. For instance, after one of our country's plastic plants invested tens of thousands of yuan to set up a cooling tower, the amount of water the plant uses in producing 1 ton of plastic decreased from 300-plus to 40 tons, the water recovery rate has reached 80 to 90 percent and nearly 30,000 yuan in water costs are saved yearly. If the national reuse rate for cooling water were to reach 70 percent, over 4 million tons of water could be saved each day.

The Recovery and Utilization of Wastewater. A paper mill in Tianjin Municipality established a closed water system, began recycling its industrial water and reduced its daily water use from 3,000 to 300 tons, a saving of 90 percent.

Water Recycling. The technique of countercurrent purification for water recycling has been implemented in the production process in the chemical industry, electroplating and textile, printing and dyeing. The comparatively clear water discharged from one technological process is used in another

process. After the electroplating and the printing and dyeing industries adopted this technology, at least 30 percent of industrial water could be saved.

Technological Innovation and Adoption of New Techniques. A Canadian oil refinery used gas cooling to replace water cooling and reduced water use to 0.2 tons for each ton of crude oil refined. For heating, if hot water were used instead of steam, water use in this area could be reduced by one-third.

The Replacement of Higher Quality Water With Lower Quality Water and Exchanging and Using Wastewater. Steel mills, electric power plants and chemical industry factories located near seashores can use sea water to replace fresh water in cooling. And coastal cities can use sea water for sanitation. In large and medium-sized northern cities, lower quality groundwater from shallower depths can be used instead of top quality deep groundwater. In Qingdao, 22 plants and enterprises have adopted the method of exchanging and using wastewater and saved over 3,400 tons of water every day.

In the past 2 years, some cities have achieved gratifying results in water conservation. Nevertheless, compared to industrially developed countries, which have industrial water reuse rates of 60 to 80 percent, our national level still falls short. China's large and medium-sized cities still possess great potential for industrial water conservation.

12272
CSO: 4008/155

POLLUTION OF GUANGZHOU'S WATER SOURCES SERIOUS

Guangzhou NANFANG RIBAO in Chinese 24 Feb 84 p 1

[Article: "The Drinking Water of Guangzhou is Threatened by Industrial Pollution"]

[Text] This year, we must emphasize the protection of water sources in Guangzhou and consider sources of industrial pollution near points where sources of running water draw their water as major targets so that treatment will be completed within a specific time. This is the request made by deputy mayor Lai Chuyan [6351 4554 1484] in yesterday's Meeting Commending Water Conservation and Mobilizing to Protect Water Sources in Guangzhou.

The problem of solving the increasing threat to Guangzhou's drinking water by pollution is an urgent task. According to investigative data, it is shown that because of the impact of various kinds of industrial effluent, residue and domestic sewage, garbage and excrement, the 6 major pollutants in the water of the Zhu Jiang at Guangzhou is increasing every year. At present, the sources from which water is drawn in 6 out of the 9 water plants in Guangzhou have been seriously affected by industrial pollution. Especially worrisome is that up to this point, there are still some departments and units which do not pay enough attention to the protection of water sources. They ignore the advice of environmental protection and water supply departments, and while the situation is not too bad and in areas where sources for running water are few, they plan to continue building plants or tourist sites which will cause water pollution. This phenomenon must be stopped.

12380
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PROGRESS ON DESALINATION TECHNIQUES REPORTED

Beijing RENMIN RIBAO in Chinese 16 Dec 83 p 3

[Text] The desalination laboratory at the State Oceanography Bureau's 2nd Institute of Oceanography has been engaged in the study of desalination and water treatment techniques for 13 years. It has achieved remarkable results in water resource exploitation techniques.

The exploitation of water resources involves comprehensive research on water treatment techniques. It includes the desalination of seawater, bitter-brackish water, the utilization of surface and ground water, and the transformation of industrial effluent and sewage into water resources for production and daily use. After assiduous study in techniques and theories, the seawater desalination laboratory of the State Oceanography Bureau's 2nd Institute of Oceanography completed 25 assigned tasks. Some of the projects won achievement awards at the national science conference and Zhejiang Provincial science conference. The various kinds of water desalination equipment and parts which they have developed have been used in over 10 provinces and cities. The electrodialytic desalination equipment, which they have developed for troops stationed in the Xisha Islands, produces 200 tons of desalinated water a day. When the equipment was put into operation, it was well received. The quality of the desalinated water produced meets the national drinking water standard.

In order to quickly transform the scientific research results in seawater desalination and water treatment techniques into a productive force and serve the nation's four modernizations, the "State Oceanography Bureau's Desalination and Water Treatment Techniques Development Center in Hangzhou" has been established on the basis of the above-mentioned laboratory, thereby, forming an integrated body of scientific research, production and technical services.

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